PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

To:

United States Patent and Trademark Office
(Box PCT)
Crystal Plaza 2
Washington, DC 20231
ÉTATS-UNIS D'AMÉRIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 11 June 1999 (11.06.99)	
International application No. PCT/JP98/04475	**Applicant's or agent's file reference** 660856
International filing date (day/month/year) 05 October 1998 (05.10.98)	**Priority date** (day/month/year) 08 October 1997 (08.10.97)
Applicant KATO, Seishi et al	

1. The designated Office is hereby notified of its election made:

[X] in the demand filed with the International Preliminary Examining Authority on:

23 April 1999 (23.04.99)

[ ] in a notice effecting later election filed with the International Bureau on:

2. The election [X] was

[ ] was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Lazar Joseph Panaral

PATENT COOPERATION TREATY

PCT

From the INTERNATIONAL BUREAU

To:

AOYAMA, Tamotsu
Aoyama & Partners
IMP Building
3-7, Shiromi 1-chome
Chuo-ku, Osaka-shi
Osaka 540-0001
JAPON

NOTIFICATION OF THE RECORDING OF A CHANGE

(PCT Rule 92bis.1 and Administrative Instructions, Section 422)

Date of mailing (day/month/year)
01 April 1999 (01.04.99)

Applicant's or agent's file reference
660856

IMPORTANT NOTIFICATION

International application No.
PCT/JP98/04475

International filing date (day/month/year)
05 October 1998 (05.10.98)

1. The following indications appeared on record concerning:

[X] the applicant [X] the inventor [ ] the agent [ ] the common representative

Name and Address
YAMAGUCHI, Tomoko
5-13-11, Takasago
Katsushika-ku
Tokyo 125-0054
Japan

State of Nationality: JP
State of Residence: JP
Telephone No.:
Facsimile No.:
Teleprinter No.:

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

[ ] the person [X] the name [X] the address [ ] the nationality [ ] the residence

Name and Address
KIMURA, Tomoko
302, 4-1-28, Nishiikuta
Tama-ku
Kawasaki-shi
Kanagawa 214-0037
Japan

State of Nationality: JP
State of Residence: JP
Telephone No.:
Facsimile No.:
Teleprinter No.:

3. Further observations, if necessary:

4. A copy of this notification has been sent to:

[X] the receiving Office
[X] the International Searching Authority
[X] the designated Offices concerned
[ ] the elected Offices concerned

1211 Geneva 20, Switzerland
Facsimile No. (41-22) 740 14 35 Telephone No. (41-22) 338 83 38

PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION CONCERNING SUBMISSION OR TRANSMITTAL OF PRIORITY DOCUMENT

(PCT Administrative Instructions, Section 411)

To:

AOYAMA, Tamotsu
Aoyama & Partners
IMP Buildings
3-7, Shiromi 1-chome
Chuo-ku, Osaka-shi
Osaka 540-0001
JAPON

Date of mailing (day/month/year) 23 November 1998 (23.11.98)	
Applicant's or agent's file reference 660856	**IMPORTANT NOTIFICATION**
International application No. PCT/JP98/04475	International filing date (day/month/year) 05 October 1998 (05.10.98)
International publication date (day/month/year) Not yet published	Priority date (day/month/year) 08 October 1997 (08.10.97)
Applicant SAGAMI CHEMICAL RESEARCH CENTER et al	

1. The applicant is hereby notified of the date of receipt (except where the letters "NR" appear in the right-hand column) by the International Bureau of the priority document(s) relating to the earlier application(s) indicated below. Unless otherwise indicated by an asterisk appearing next to a date of receipt, or by the letters "NR", in the right-hand column, the priority document concerned was submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b).

2. This updates and replaces any previously issued notification concerning submission or transmittal of priority documents.

3. An **asterisk(*)** appearing next to a date of receipt, in the right-hand column, denotes a priority document submitted or transmitted to the International Bureau but not in compliance with Rule 17.1(a) or (b). In such a case, **the attention of the applicant is directed** to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.

4. The **letters "NR"** appearing in the right-hand column denote a priority document which was not received by the International Bureau or which the applicant did not request the receiving Office to prepare and transmit to the International Bureau, as provided by Rule 17.1(a) or (b), respectively. In such a case, **the attention of the applicant is directed** to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.

Priority date	Priority application No.	Country or regional Office or PCT receiving Office	Date of receipt of priority document
08 Octo 1997 (08.10.97)	9/276271	JP	20 Nove 1998 (20.11.98)

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No. (41-22) 740.14.35

Authorized officer

Telephone No. (41-22) 338.83.38

PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF RECEIPT OF RECORD COPY

(PCT Rule 24.2(a))

受付
10.11.16

To:

AOYAMA, Tamotsu
Aoyama & Partners
IMP Buildings
3-7, Shiromi 1-chome
Chuo-ku, Osaka-shi
Osaka 540-0001
JAPON

Date of mailing (day/month/year)	IMPORTANT NOTIFICATION
16 October 1998 (16.10.98)	
Applicant's or agent's file reference	**International application No.**
660856	PCT/JP98/04475

The applicant is hereby notified that the International Bureau has received the record copy of the international application as detailed below.

Name(s) of the applicant(s) and State(s) for which they are applicants:

SAGAMI CHEMICAL RESEARCH CENTER et al (for all designated States except US)
KATO, Seishi et al (for US)

International filing date	:	05 October 1998 (05.10.98)
Priority date(s) claimed	:	08 October 1997 (08.10.97)
Date of receipt of the record copy by the International Bureau	:	16 October 1998 (16.10.98)
List of designated Offices	:	

EP :AT,BE,CH,CY,DE,DK,ES,FI,FR,GB,GR,IE,IT,LU,MC,NL,PT,SE
National :AU,CA,JP,MX,US

ATTENTION

The applicant should carefully check the data appearing in this Notification. In case of any discrepancy between these data and the indications in the international application, the applicant should immediately inform the International Bureau.

In addition, the applicant's attention is drawn to the information contained in the Annex, relating to:

- [X] time limits for entry into the national phase
- [X] confirmation of precautionary designations
- [X] requirements regarding priority documents

A copy of this Notification is being sent to the receiving Office and to the International Searching Authority.

The International Bureau of WIPO

Authorized officer

PATENT COOPERATION TREATY

PCT

From the INTERNATIONAL BUREAU

To:

AOYAMA, Tamotsu
Aoyama & Partners
IMP Building
3-7, Shiromi 1-chome
Chuo-ku, Osaka-shi
Osaka 540-0001
JAPON

NOTIFICATION OF THE RECORDING OF A CHANGE

(PCT Rule 92bis.1 and Administrative Instructions, Section 422)

Date of mailing (day/month/year)
01 April 1999 (01.04.99)

Applicant's or agent's file reference
660856

IMPORTANT NOTIFICATION

International application No.
PCT/JP98/04475

International filing date (day/month/year)
05 October 1998 (05.10.98)

1. The following indications appeared on record concerning:

[X] the applicant [X] the inventor [ ] the agent [ ] the common representative

Name and Address
YAMAGUCHI, Tomoko
5-13-11, Takasago
Katsushika-ku
Tokyo 125-0054
Japan

State of Nationality: JP
State of Residence: JP
Telephone No.:
Facsimile No.:
Teleprinter No.:

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

[ ] the person [X] the name [X] the address [ ] the nationality [ ] the residence

Name and Address
KIMURA, Tomoko
302, 4-1-28, Nishiikuta
Tama-ku
Kawasaki-shi
Kanagawa 214-0037
Japan

State of Nationality: JP
State of Residence: JP
Telephone No.:
Facsimile No.:
Teleprinter No.:

3. Further observations, if necessary:

4. A copy of this notification has been sent to:

[ ] the International Preliminary Examining Authority [ ] other:

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Authorized officer

Facsimile No.: 41 22 740 14 35

Telephone No.: 41 22 338 83 38

WO 99/18203
PCT/JP98/04475

PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

To:
AOYAMA, Tamotsu
Aoyama & Partners
IMP Building
3-7, Shiromi 1-chome
Chuo-ku, Osaka-shi
Osaka 540-0001
JAPON

NOTICE INFORMING THE APPLICANT OF THE COMMUNICATION OF THE INTERNATIONAL APPLICATION TO THE DESIGNATED OFFICES

(PCT Rule 47.1(c), first sentence)

Date of mailing (day/month/year)	
15 April 1999 (15.04.99)	
Applicant's or agent's file reference 660856	**IMPORTANT NOTICE**

International application No.	International filing date (day/month/year)	Priority date (day/month/year)
PCT/JP98/04475	05 October 1998 (05.10.98)	08 October 1997 (08.10.97)

Applicant
SAGAMI CHEMICAL RESEARCH CENTER et al

1. Notice is hereby given that the International Bureau has communicated, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this Notice:
   AU,EP,JP,US

   In accordance with Rule 47.1(c), third sentence, those Offices will accept the present Notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:
   CA,MX

   The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the international application (Rule 49.1(a-bis)).

3. Enclosed with this Notice is a copy of the international application as published by the International Bureau on
   15 April 1999 (15.04.99) under No. WO 99/18203

REMINDER REGARDING CHAPTER II (Article 31(2)(a) and Rule 54.2)

If the applicant wishes to postpone entry into the national phase until 30 months (or later in some Offices) from the priority date, **a demand for international preliminary examination** must be filed with the competent International Preliminary Examining Authority before the expiration of 19 months from the priority date.

It is the applicant's sole responsibility to monitor the 19-month time limit.

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

REMINDER REGARDING ENTRY INTO THE NATIONAL PHASE (Article 22 or 39(1))

If the applicant wishes to proceed with the international application in the **national phase**, he must, within 20 months or 30 months, or later in some Offices, perform the acts referred to therein before [illegible]

The International Bureau of WIPO

Authorized officer

PATENT COOPERATION TREATY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

PCT

To:
AOYAMA Tamotsu
AOYAMA & PARTNERS
IMP Building, 3-7, Shiromi
1-chome, Chuo-ku, Osaka-shi
Osaka 540-0001
JAPON

NOTIFICATION OF RECEIPT OF DEMAND BY COMPETENT INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

(PCT Rules 59.3(e) and 61.1(b), first sentence and Administrative Instructions, Section 601(a))

Date of mailing *(day/month/year)* 0 2. 06. 99	
Applicant's or agent's file reference 660856	**IMPORTANT NOTIFICATION**

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/ JP 98/ 04475	05/10/1998	08/10/1997

Applicant
SAGAMI CHEMICAL RESEARCH CENTER et al.

1. The applicant is hereby **notified** that this International Preliminary Examining Authority considers the following date as the date of receipt of the demand for international preliminary examination of the international application:

23/04/1999

2. This date of receipt is:

- [X] the actual date of receipt of the demand by this Authority (Rule 61.1(b)).
- [ ] the actual date of receipt of the demand on behalf of this Authority (Rule 59.3(e)).
- [ ] the date on which this Authority has, in response to the invitation to correct defects in the demand (Form PCT/IPEA/404), received the required corrections.

3. [ ] **ATTENTION:** That date of receipt is **AFTER** the expiration of 19 months from the priority date. Consequently, the election(s) made in the demand does (do) not have the effect of postponing the entry into the national phase until 30 months from the priority date (or later in some Offices) (Article 39(1)). Therefore, the acts for entry into the national phase must be performed within 20 months from the priority date (or later in some Offices) (Article 22). For details, see the *PCT Applicant's Guide*, Volume II.

[ ] *(If applicable)* This notification confirms the information given by telephone, facsimile transmission or in person on:

Name and mailing address of the IPEA/	Authorized officer
Fax:	Telephone No.

PATENT COOPERATION TREATY

PCT

From the INTERNATIONAL BUREAU

To:

AOYAMA, Tamotsu
Aoyama & Partners
IMP Building
3-7, Shiromi 1-chome
Chuo-ku, Osaka-shi
Osaka 540-0001
JAPON

INFORMATION CONCERNING ELECTED OFFICES NOTIFIED OF THEIR ELECTION

(PCT Rule 61.3)

Date of mailing (day/month/year)
11 June 1999 (11.06.99)

Applicant's or agent's file reference
660856

IMPORTANT INFORMATION

International application No.	**International filing date** (day/month/year)	**Priority date** (day/month/year)
PCT/JP98/04475	05 October 1998 (05.10.98)	08 October 1997 (08.10.97)

Applicant
SAGAMI CHEMICAL RESEARCH CENTER et al

1. The applicant is hereby informed that the International Bureau has, according to Article 31(7), notified each of the following Offices of its election:

   EP :AT,BE,CH,CY,DE,DK,ES,FI,FR,GB,GR,IE,IT,LU,MC,NL,PT,SE
   National :AU,CA,JP,US

2. The following Offices have waived the requirement for the notification of their election; the notification will be sent to them by the International Bureau only upon their request:

   National :MX

3. The applicant is reminded that he must enter the "national phase" **before the expiration of 30 months from the priority date** before each of the Offices listed above. This must be done by paying the national fee(s) and furnishing , if prescribed, a translation of the international application (Article 39(1)(a)), as well as, where applicable, by furnishing a translation of any annexes of the international preliminary examination report (Article 36(3)(b) and Rule 74.1).

   Some offices have fixed time limits expiring later than the above-mentioned time limit. For detailed information about the applicable time limits and the acts to be performed upon entry into the national phase before a particular Office, see Volume II of the PCT Applicant's Guide.

   The entry into the European regional phase is postponed **until 31 months from the priority date** for all States designated for the purposes of obtaining a European patent.

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No. 41-22) 740.14.35

Telephone No. 41-22) 338.83.38

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
660856		
International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/JP98/04475	05/10/1998	08/10/1997
International Patent Classification (IPC) or national classification and IPC		
C12N15/12		
Applicant		
SAGAMI CHEMICAL RESEARCH CENTER et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 6 sheets, including this cover sheet.

   ☐ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of sheets.

3. This report contains indications relating to the following items:

   I ☒ Basis of the report
   II ☐ Priority
   III ☒ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   IV ☒ Lack of unity of invention
   V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations suporting such statement
   VI ☒ Certain documents cited
   VII ☐ Certain defects in the international application
   VIII ☐ Certain observations on the international application

Date of submission of the demand: 23/04/1999

Date of completion of this report: 14.01.00

Name and mailing address of the international preliminary examining authority:
European Patent Office
D-80298 Munich
Tel. +49 89 2399 - 0 Tx. 523656 epmu d
Fax +49 89 2399 - 4465

Authorized officer: Armandola, E.

Telephone No. +49 89 2399 7493

Form PCT/IPEA/409 (cover sheet) (January 1994)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/JP98/04475

I. Basis of the report

1. This report has been drawn on the basis of (*substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.*):

Description, pages:

1-68 as originally filed

Claims, No.:

1-6 as originally filed

Drawings, sheets:

1/10-10/10 as originally filed

2. The amendments have resulted in the cancellation of:

☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

4. Additional observations, if necessary:

III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

[illegible] that the claimed invention appears to be novel, to involve an inventive step (to be non-obvious),

☐ the entire international application

☒ claims Nos. 1-6 partially.

[illegible]

☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (*specify*):

☐ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. are so unclear that no meaningful opinion could be formed (*specify*):

☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.

☒ no international search report has been established for the said claims Nos. 1-6 partially.

IV. Lack of unity of invention

1. In response to the invitation to restrict or pay additional fees the applicant has:

   ☐ restricted the claims.

   ☐ paid additional fees.

   ☐ paid additional fees under protest.

   ☐ neither restricted nor paid additional fees.

2. ☒ This Authority found that the requirement of unity of invention is not complied and chose, according to Rule 68.1, not to invite the applicant to restrict or pay additional fees.

3. This Authority considers that the requirement of unity of invention in accordance with Rules 13.1, 13.2 and 13.3 is

   ☐ complied with.

   ☒ not complied with for the following reasons:

   separate sheet

   examination in establishing this report

   ☐ all parts.

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-6 (partially)
	No:	Claims	
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-6 (partially)
Industrial applicability (IA)	Yes:	Claims	1-6 (partially)
	No:	Claims	

2. Citations and explanations

see separate sheet

VI. Certain documents cited

1. Certain published documents (Rule 70.10)

and / or

2. Non-written disclosures (Rule 70.9)

see separate sheet

Re Item III

Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

A Partial International Search has been performed only with regard to the first invention (Claims 1-6, partially) identified by the ISA. For this reason no opinion has been established with regard to the other nine inventions listed by the ISA.

Re Item IV

Lack of unity of invention

The IPEA agrees with the objection put forward by the ISA as to the lack of unity of the present application .

Re Item V

Reasoned statement under Art. 35 (2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Novelty (Art. 33(2) PCT)

The subject matter of those parts of Claims 1-6 referring to a protein with the sequence of SEQ. ID. NO: 1 and to a nucleic acid with the sequence of SEQ.ID.NO:11 and 21 has not been disclosed in the prior art. These part of the claims, therefore, fulfill the requirements of Art. 33(2) with regard to novelty.

2. Inventive step (Art 33(3) PCT)

The subject-matter of Claims 1-6 refers to a protein of unknown function possessing a [illegible] trans-membrane sequence, the DNA and cDNA encoding this protein as well as [illegible] DNA

[illegible] inventive step cannot be acknowledged.

Due to the fact that the claimed sequences are not associated with any known technical effect, the only problem to be solved which might be recognized is the provision of further DNA sequences as such, regardless of their possible useful properties. In this case all

known DNA sequences encoding transmembrane proteins are equally suitable candidates for solving the above "technical problem" and would , therefore, all equally be suggested to the skilled person. The arbitrary selection from an infinite number of equally obvious possible solutions cannot involve an inventive step because, in order to be patentable, the selection must not be arbitrary but must be justified by the technical purpose, e.g. by a hitherto unknown or unexpected technical effect which is caused by those structural features distinguishing the claimed compounds from the numerous other ones.

Re Item VI

Certain documents cited

Certain published documents (Rule 70.10)

Patent No (day/month/year)	Publication date (day/month/year)	Filing date (day/month/year)	Priority date (valid claim)
PCT/US97/10956	08.01.98	25.06.97	03.07.96
PCT/US98/10041	19.11.98	15.05.98	15.05.97
PCT/US98/09972	19.11.98	15.05.98	15.05.97

Document PCT/US97/10956 was published after but filed before the priority date of the present application. It does, therefore, not constitute part of the state of the art in the meaning of Rule 64(1)(b) PCT. It will, however become of relevance for the novelty of the claimed subject-matter during regional phase examination, and if it later turns out that the priority of the present application has not been correctly claimed, also for the inventive step involved with the claimed subject-matter.

Documents PCT/US98/10041 and PCT/US98/09972 were published and filed after the priority date of the present application. However, said documents claim a priority date (15.5.97) [illegible] If this priority is valid the documents will

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference	**FOR FURTHER ACTION**	see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below
660856		
International application No.	International filing date *(day/month/year)*	(Earliest) Priority Date *(day/month/year)*
PCT/JP 98/04475	05/10/1998	08/10/1997

Applicant

SAGAMI CHEMICAL RESEARCH CENTER et al.

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 6 sheets.

☐ It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**

a. With regard to the **language,** the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

☒ contained in the international application in written form.

☒ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readble form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2 ☐ **Certain claims were found unsearchable** (See Box I)

3 ☒ **Unity of invention is lacking** (see Box II)

4 With regard to the **title,**

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows.

within one month from the date of mailing of this international search report, submit comments to this Authority.

6 The figure of the **drawings** to be published with the abstract is Figure No.

☐

☒ None of the figures

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP 98/04475

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

1. Claims: 1-6 partially

Protein comprising sequence SEQ ID NO:1; DNA encoding it; cDNA comprising SEQ ID NO:11 or 21; vector and host cell capable of expressing the same.

2. Claims: 1-6 partially

Protein comprising sequence SEQ ID NO:2; DNA encoding it; cDNA comprising SEQ ID NO:12 or 23; vector and host cell capable of expressing the same.

3. Claims: 1-6 partially

Protein comprising sequence SEQ ID NO:3; DNA encoding it; cDNA comprising SEQ ID NO:13 or 25; vector and host cell capable of expressing the same.

4. Claims: 1-6 partially

Protein comprising sequence SEQ ID NO:4; DNA encoding it; cDNA comprising SEQ ID NO:14 or 27; vector and host cell capable of expressing the same.

5. Claims: 1-6 partially

Protein comprising sequence SEQ ID NO:5; DNA encoding it; cDNA comprising SEQ ID NO:15 or 29; vector and host cell capable of expressing the same.

6. Claims: 1-6 partially

Protein comprising sequence SEQ ID NO:6; DNA encoding it; cDNA comprising SEQ ID NO:16 or 31; vector and host cell capable of expressing the same.

7. Claims: 1-6 partially

Protein comprising sequence SEQ ID NO:7; DNA encoding it;

8. Claims: 1-6 partially

Protein comprising sequence SEQ ID NO:8; DNA encoding it;

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

9. Claims: 1-6 partially

Protein comprising sequence SEQ ID NO:9; DNA encoding it; cDNA comprising SEQ ID NO:19 or 37; vector and host cell capable of expressing the same.

10. Claims: 1-6 partially

Protein comprising sequence SEQ ID NO:10; DNA encoding it; cDNA comprising SEQ ID NO:20 or 39; vector and host cell capable of expressing the same.

INTERNATIONAL SEARCH REPORT

[redacted]ational Application No
PCT/JP 98/04475

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 C12N15/12 C07K14/47 C12N15/79 C12N5/10

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 C12N C07K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No
A	Genbank Database Entry GGSCA2A Accession number L34554; 16 July 1994 PETRENKO O. ET AL.:"Characterization of changes in gene expression associated with leukemic transformation by the NK-kB family member v-Rel" XP002089382 cited in the application see the whole document ---	1-6
A	EMBL Database Entry HS1268023 Accession number AA476643; 23 June 1997 HILLIER ET AL.:"WashU-Merck EST Project 1997" XP002089383 cited in the application see the whole document ---	1-6

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7 January 1999

23.04.99

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No
P,X	WO 98 00540 A (INCYTE PHARMACEUTICALS, INC.) 8 January 1998 see page 2, line 18 - page 3, line 5 see sequences SEQ ID NO:2 and 4	1-3,5,6
P,X	ROBERT E. REITER ET AL.: "Prostate stem cell antigen: A cell surface marker overexpressed in prostate cancer" PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF USA, vol. 95, no. 4, 17 February 1998, pages 1735-1740, XP002089381 WASHINGTON US see page 1735, right-hand column, paragraph 2; figure 2	1,2,5,6
F	WO 98 51805 A (ABBOTT LABORATORIES) 19 November 1998 see page 5, line 28 - page 6, line 14 see sequences SEQ ID NO:11, 12, 25	1-6
E	WO 98 51824 A (ABBOTT LABORATORIES) 19 November 1998 see page 5, line 8 - line 20 see sequences SEQ ID NO:11, 12, 25	1-6

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/JP 98/04475

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9800540 A	08-01-1998	US 5856136 A	05-01-1999
		AU 3501197 A	21-01-1998
		EP 0909318 A	21-04-1999
WO 9851805 A	19-11-1998	NONE	
WO 9851824 A	19-11-1998	NONE	

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WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 :
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(30) Priority Data:
9-276271 8 October 1997 (08.10.97) JP

(71) Applicants *(for all designated States except US)*: SAGAMI CHEMICAL RESEARCH CENTER [JP/JP]; 4-1, Nishi-Ohnuma 4-chome, Sagamihara-shi, Kanagawa 229-0012 (JP). PROTEGENE INC. [JP/JP]; 2-20-3, Naka-cho, Meguro-ku, Tokyo 153-0065 (JP).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: KATO, Seishi [JP/JP]; 3-46-50, Wakamatsu, Sagamihara-shi, Kanagawa 229-0014 (JP). YAMAGUCHI, Tomoko [JP/JP]; 5-13-11, Takasago, Katsushika-ku, Tokyo 125-0054 (JP). SEKINE, Shingo [JP/JP]; Remonzu 101, 2-8-15, Atago, Ageo-shi, Saitama 362-0034 (JP). KOBAYASHI, Midori [JP/JP]; Royal Court 306, 3-2-3, Minami-Rinkan, Yamato-shi, Kanagawa 242-0006 (JP).

(74) Agents: AOYAMA, Tamotsu et al.; Aoyama & Partners, IMP Building, 3-7, Shiromi 1-chome, Chuo-ku, Osaka-shi, Osaka 540-0001 (JP).

(81) Designated States: AU, CA, JP, MX, US, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

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(54) Title: HUMAN PROTEINS HAVING TRANSMEMBRANE DOMAINS AND cDNAs ENCODING THESE PROTEINS

(57) Abstract

The invention provides human proteins having transmembrane domains and cDNAs coding for these proteins as well as eukaryotic cells expressing said cDNAs. All of the proteins exist in the cell membrane, so that they are considered to be proteins controlling the proliferation and the differentiation of the cells. Accordingly, the proteins can be employed as pharmaceuticals such as carcinostatic agents relating to the control of the proliferation and the differentiation of the cells or as antigens for preparing antibodies against said proteins. The cDNAs can be utilized as probes for the gene diagnosis and gene sources for the gene therapy. Furthermore, the cDNAs can be utilized for large-scale expression of said proteins. Cells, wherein these membrane protein genes are introduced and membrane proteins are expressed in large amounts, can be utilized for detection of the corresponding ligands, screening of novel low-molecular pharmaceuticals, and so on.

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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		

INTERNATIONAL SEARCH REPORT

International Application No
PCT/JP 98/04475

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 C12N15/12 C07K14/47 C12N15/79 C12N5/10

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"O" document referring to an oral disclosure, use, exhibition or other means

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/JP 98/04475

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No
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E	WO 98 51824 A (ABBOTT LABORATORIES) 19 November 1998 see page 5, line 8 - line 20 see sequences SEQ ID NO:11, 12, 25 -----	1-6

INTERNATIONAL SEARCH REPORT

International application No
PCT/JP 98/04475

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons

1 ☐ Claims Nos
because they relate to subject matter not required to be searched by this Authority, namely

2. ☐ Claims Nos
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically

3 ☐ Claims Nos
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6 4(a)

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows

see additional sheet

1 ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims

2 ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee

3 ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos

4 ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

INTERNATIONAL SEARCH REPORT

International Application No PCT/JP 98/04475

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

1. Claims: 1-6 partially

   Protein comprising sequence SEQ ID NO:1; DNA encoding it; cDNA comprising SEQ ID NO:11 or 21; vector and host cell capable of expressing the same.

2. Claims: 1-6 partially

   Protein comprising sequence SEQ ID NO:2; DNA encoding it; cDNA comprising SEQ ID NO:12 or 23; vector and host cell capable of expressing the same.

3. Claims: 1-6 partially

   Protein comprising sequence SEQ ID NO:3; DNA encoding it; cDNA comprising SEQ ID NO:13 or 25; vector and host cell capable of expressing the same.

4. Claims: 1-6 partially

   Protein comprising sequence SEQ ID NO:4; DNA encoding it; cDNA comprising SEQ ID NO:14 or 27; vector and host cell capable of expressing the same.

5. Claims: 1-6 partially

   Protein comprising sequence SEQ ID NO:5; DNA encoding it; cDNA comprising SEQ ID NO:15 or 29; vector and host cell capable of expressing the same.

6. Claims: 1-6 partially

   Protein comprising sequence SEQ ID NO:6; DNA encoding it; cDNA comprising SEQ ID NO:16 or 31; vector and host cell capable of expressing the same.

7. Claims: 1-6 partially

   [illegible]

8. Claims: 1-6 partially

   [illegible] DNA comprising SEQ ID [illegible] capable of expressing the same.

INTERNATIONAL SEARCH REPORT

International Application No. PCT/JP 98/04475

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

9. Claims: 1-6 partially

Protein comprising sequence SEQ ID NO:9; DNA encoding it; cDNA comprising SEQ ID NO:19 or 37; vector and host cell capable of expressing the same.

10. Claims: 1-6 partially

Protein comprising sequence SEQ ID NO:10; DNA encoding it; cDNA comprising SEQ ID NO:20 or 39; vector and host cell capable of expressing the same.

INTERNATIONAL SEARCH REPORT

ormation on patent family members

International Application No
PCT/JP 98/04475

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9800540 A	08-01-1998	US 5856136 A	05-01-1999
		AU 3501197 A	21-01-1998
		EP 0909318 A	21-04-1999
WO 9851805 A	19-11-1998	NONE	
WO 9851824 A	19-11-1998	NONE	

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WORLD INTELLECTUAL PROPERTY ORGANIZATION
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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 :
C12N 15/12, C07K 14/47, C12N 15/79, 5/10

A2

(11) International Publication Number: WO 99/18203

(43) International Publication Date: 15 April 1999 (15.04.99)

(21) International Application Number: PCT/JP98/04475

(22) International Filing Date: 5 October 1998 (05.10.98)

(30) Priority Data:
9-276271 8 October 1997 (08.10.97) JP

(71) Applicants (*for all designated States except US*): SAGAMI CHEMICAL RESEARCH CENTER [JP/JP]; 4-1, Nishi-Ohnuma 4-chome, Sagamihara-shi, Kanagawa 229-0012 (JP). PROTEGENE INC. [JP/JP]; 2-20-3, Naka-cho, Meguro-ku, Tokyo 153-0065 (JP).

(72) Inventors; and
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(81) Designated States: AU, CA, JP, MX, US, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

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(57) Abstract

The invention provides human proteins having transmembrane domains and cDNAs coding for these proteins as well as eukaryotic cells expressing said cDNAs. All of the proteins exist in the cell membrane, so that they are considered to be proteins controlling the proliferation and the differentiation of the cells. Accordingly, the proteins can be employed as pharmaceuticals such as carcinostatic agents relating to the control of the proliferation and the differentiation of the cells or as antigens for preparing antibodies against said proteins. The cDNAs can be utilized as probes for the gene diagnosis and gene sources for the gene therapy. Furthermore, the cDNAs can be utilized for large-scale expression of said proteins. Cells, wherein these membrane protein genes are introduced and membrane proteins are expressed in large amounts, can be utilized for detection of the corresponding ligands, screening of novel low-molecular pharmaceuticals, and so on.

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DESCRIPTION

Human Proteins Having Transmembrane Domains and DNAs Encoding these Proteins

TECHNICAL FIELD

The present invention relates to human proteins having transmembrane domains and cDNAs coding for these proteins as well as eucaryotic cells expressing said cDNAs. The proteins of the present invention can be employed as pharmaceuticals or as antigens for preparing antibodies against said proteins. The human cDNAs of the present invention can be utilized as probes for the gene diagnosis and gene sources for the gene therapy. Furthermore, the cDNAs can be utilized as gene sources for large-scale production of the proteins encoded by said cDNAs. Cells, wherein these membrane protein genes are introduced and membrane proteins are expressed in large amounts, can be utilized for detection of the corresponding ligands, screening of novel low-molecular pharmaceuticals, and so on.

BACKGROUND ART

Membrane proteins play important roles, as signal receptors, ion channels, transporters, etc. in the material transportation

acids, and so on, where the genes of many of them have been cloned already.

It has been clarified that abnormalities of these membrane proteins are associated with a number of hitherto-cryptogenic diseases. For instance, a gene of a membrane protein having twelve transmembrane domains was identified as the gene responsible for cystic fibrosis [Rommens, J. M. et al., Science 245: 1059-1065 (1989)]. In addition, it has been clarified that several membrane proteins act as receptors when a virus infects the cells. For instance, HIV-1 is revealed to infect into the cells through mediation of a membrane protein fusin having a membrane protein on the T-cell membrane, a CD-4 antigen, and seven transmembrane domains [Feng, Y. et al., Science 272: 872-877 (1996)]. Therefore, discovery of a new membrane protein is anticipated to lead to elucidation of the causes of many diseases, so that isolation of a new gene coding for the membrane protein has been desired.

Heretofore, owing to difficulty in the purification, many membrane proteins have been isolated by an approach from the gene side. A general method is the so-called expression cloning which comprises transfection of a cDNA library in eucaryotic cells to express cDNAs and then detection of the cells expressing the target membrane protein on the membrane by an immunological technique using an antibody or a physiological technique on the change in

In general, membrane proteins possess hydrophobic

synthesis thereof in the ribosome, these domains remain in the phospholipid membrane to be trapped in the membrane. Accordingly, the evidence of the cDNA for encoding the membrane protein is provided by determination of the whole base sequence of a full-length cDNA followed by detection of highly hydrophobic transmembrane domains in the amino acid sequence of the protein encoded by said cDNA.

DISCLOSURE OF INVENTION

The object of the present invention is to provide novel human proteins having transmembrane domains and DNAs coding for said proteins as well as transformation eucaryotic cells that are capable of expressing said cDNAs.

As the result of intensive studies, the present inventors have been successful in cloning of cDNAs coding for proteins having transmembrane domains from the human full-length cDNA bank, thereby completing the present invention. In other words, the present invention provides human proteins having transmembrane domains, namely proteins containing any of the amino acid sequences represented by Sequence Nos. 1 to 10. Moreover, the present invention provides DNAs coding for the above-mentioned proteins, exemplified by cDNAs containing any of the base sequences represented by Sequence Nos. 11 to No. 20, as well as

BRIEF DESCRIPTION OF DRAWINGS

Figure 1: A figure depicting the hydrophobicity/hydrophilicity profile of the protein encoded by clone HP01244.

Figure 2: A figure depicting the hydrophobicity/hydrophilicity profile of the protein encoded by clone HP01498.

Figure 3: A figure depicting the hydrophobicity/hydrophilicity profile of the protein encoded by clone HP01565.

Figure 4: A figure depicting the hydrophobicity/hydrophilicity profile of the protein encoded by clone HP01606.

Figure 5: A figure depicting the hydrophobicity/hydrophilicity profile of the protein encoded by clone HP01737.

Figure 6: A figure depicting the hydrophobicity/hydrophilicity profile of the protein encoded by clone HP01962.

Figure 7: A figure depicting the hydrophobicity/hydrophilicity profile of the protein encoded by clone HP10435.

Figure 8: A figure depicting the

Figure 9: A figure depicting the

clone HP10461.

Figure 10: A figure depicting the hydrophobicity/hydrophilicity profile of the protein encoded by clone HP10495.

BEST MODE FOR CARRYING OUT OF THE INVENTION

The proteins of the present invention can be obtained, for example, by a method for isolation from human organs, cell lines, etc., a method for preparation of peptides by the chemical synthesis, or a method for production with the recombinant DNA technology using the DNAs coding for the transmembrane domains of the present invention, wherein the method for obtainment by the recombinant DNA technology is employed preferably. For instance, in vitro expression of the proteins can be achieved by preparation of an RNA by in vitro transcription from a vector having one of cDNAs of the present invention, followed by in vitro translation using this RNA as a template. Also, recombination of the translation region into a suitable expression vector by the method known in the art leads to production of a large amount of the encoded protein by using prokaryotic cells such as *Escherichia coli*, *Bacillus subtilis*, etc., and eucaryotic cells such as yeasts, insect cells, mammalian cells, etc.

In the case in which a protein of the present invention

the DNA of the present invention is constructed in an expression

cDNA-cloning site, a terminator etc., which can be replicated in the microorganism, and, after transformation of the host cells with said expression vector, the thus-obtained transformant is incubated, whereby the protein encoded by said cDNA can be produced on a large scale in the microorganism. In this case, a protein fragment containing an optional region can be obtained by carrying out the expression with inserting an initiation codon and a termination codon in front of and behind an optional translation region. Alternatively, a fusion protein with another protein can be expressed. Only a protein portion coding for said cDNA can be obtained by cleavage of said fusion protein with a suitable protease.

In the case in which one of the proteins of the present invention is produced in eucaryotic cells, the protein of the present invention can be produced as a transmembrane protein on the cell-membrane surface, when the translation region of said cDNA is subjected to recombination to an expression vector for eucaryotic cells that has a promoter, a splicing region, a poly(A) insertion site, etc., followed by introduction into the eucaryotic cells. The expression vector is exemplified by pKA1, Pedbdpc2, pCDM8, pSVK3, pMSG, pSVL, pBK-CMV, pBK-RSV, EBV vector, pRS, pYES2, and so on. Examples of eucaryotic cells to be used in general include mammalian culture cells such as simian kidney cells COS7,

any eucaryotic cells may be used, provided that they are capable

expression vector can be introduced in the eucaryotic cells by methods known in the art such as the electroporation method, the potassium phosphate method, the liposome method, the DEAE-dextran method, and so on.

After one of the proteins of the present invention is expressed in prokaryotic cells or eucaryotic cells, the objective protein can be isolated from the culture and purified by a combination of separation procedures known in the art. Such examples include treatment with a denaturing agent such as urea or a surface-active agent, sonication, enzymatic digestion, salting-out or solvent precipitation, dialysis, centrifugation, ultrafiltration, gel filtration, SDS-PAGE, isoelectric focusing, ion-exchange chromatography, hydrophobic chromatography, affinity chromatography, reverse phase chromatography, and so on.

The proteins of the present invention include peptide fragments (more than 5 amino acid residues) containing any partial amino acid sequence in the amino acid sequences represented by Sequence Nos. 1. to 10. These peptide fragments can be utilized as antigens for preparation of antibodies. Hereupon, among the proteins of the present invention, those having the signal sequence are secreted in the form of maturation proteins on the surface of the cells, after the signal sequences are removed. Therefore, these maturation proteins shall come within the scope

method for the cleavage-site determination in a signal sequence

some membrane proteins undergo the processing on the cell surface to be converted to the secretory forms. Such proteins or peptides in the secretory forms shall come within the scope of the present invention. When sugar chain-binding sites are present in the amino acid sequences, expression in appropriate eucaryotic cells affords proteins wherein sugar chains are added. Accordingly, such proteins or peptides wherein sugar chains are added shall come within the scope of the present invention.

The DNAs of the present invention include all DNAs coding for the above-mentioned proteins. Said DNAs can be obtained by using a method by chemical synthesis, a method by cDNA cloning, and so on.

The cDNAs of the present invention can be cloned, for example, from cDNA libraries of the human cell origin. These cDNA are synthesized by using as templates poly(A)$^+$ RNAs extracted from human cells. The human cells may be cells delivered from the human body, for example, by the operation or may be the culture cells. The cDNAs can be synthesized by using any method selected from the Okayama-Berg method [Okayama, H. and Berg, P., Mol. Cell. Biol. 2: 161-170 (1982)], the Gubler-Hoffman method [Gubler, U. and Hoffman, J. Gene 25: 263-269 (1983)], and so on, but it is preferred to use the capping method [Kato, S. et al., Gene 150: 243-250 (1994)], as exemplified in Examples, in order to obtain a

human proteins having transmembrane domains is carried out by

at random from cDNA libraries, sequencing of the amino acid sequence encoded by the base sequence, and recognition of the presence or absence of a hydrophobic site in the resulting N-terminal amino acid sequence region. Next, the secondary selection is carried out by determination of the whole sequence by the sequencing and the protein expression by in vitro translation. Ascertainment of cDNAs of the present invention for encoding the proteins having secretory signal sequences is carried out by using the signal sequence detection method [Yokoyama-Kobayashi, M. et al., Gene 163: 193-196 (1995)]. In other words, the ascertainment for a coding portion of an inserted cDNA fragment to function as a signal sequence is provided by fusing a cDNA fragment coding for the N-terminus of the target protein with a cDNA coding for the protease domain of urokinase and then expressing the resulting cDNA in COS7 cells to detect the urokinase activity in the cell culture medium. On the other hand, in the case in which the urokinase activity is not detectable in the cell medium, the N-terminal region is judged to remain in the membrane.

The cDNAs of the present invention are characterized by containing either of the base sequences represented by Sequence Nos. 11 to 20 or the base sequences represented by Sequence Nos. 21, 23, 25, 27, 29, 31, 33, 35, 37 and 39. Table 1 summarizes the clone number (HP number), the cells affording the cDNA, the total base number

Table 1

Sequence No.	HP No.	Cell	Number of bases	Number of amino acids
1, 11, 21	HP01244	Stomach Cancer	979	123
2, 12, 22	HP01498	Stomach Cancer	1279	220
3, 13, 23	HP01565	Stomach Cancer	835	81
4, 14, 24	HP01606	Stomach Cancer	1256	301
5, 15, 25	HP01737	Stomach Cancer	1305	383
6, 16, 26	HP01962	Liver	899	199
7, 17, 27	HP10435	Stomach Cancer	905	229
8, 18, 28	HP10479	PMA−U937	841	178
9, 19, 29	HP10481	PMA−U937	1451	443
10, 20, 30	HP10495	Stomach Cancer	886	130

Hereupon, the same clones as the cDNAs of the present invention can be easily obtained by screening of the cDNA libraries constructed from the human cell lines and human tissues utilized in the present invention by the use of an oligonucleotide probe synthesized on the basis of the cDNA base sequence described in any of Sequence Nos. 11 to 21, 23, 25, 27, 29, 31, 35, 37 and 39.

In general, the polymorphism due to the individual difference is frequently observed in human genes. Accordingly, any cDNA that is subjected to insertion or deletion of one or plural nucleotides and/or substitution with other nucleotides in Sequence Nos. 11 to 21, 23, 25, 27, 29, 31, 35, 37 and 39 shall

[illegible]

within the scope of the present invention, as far as the protein possesses the activity of any protein having the amino acid sequences represented by Sequence Nos. 1 to 10.

The cDNAs of the present invention include cDNA fragments (more than 10 bp) containing any partial base sequence in the base sequences represented by Sequence Nos. 11 to 20 or in the base sequences represented by Sequence Nos. 21, 23, 25, 27, 29, 30, 31, 33, 35 and 39. Also, DNA fragments consisting of a sense chain and an anti-sense chain shall come within this scope. These DNA fragments can be utilized as the probes for the gene diagnosis.

In addition to the activities and uses described above, the polynucleotides and proteins of the present invention may exhibit one or more of the uses or biological activities (including those associated with assays cited herein) identified below. Uses or activities described for proteins of the present invention may be provided by administration or use of such proteins or by administration or use of polynucleotides encoding such proteins (such as, for example, in gene therapies or vectors suitable for introduction of DNA).

Research Uses and Utilities

The polynucleotides provided by the present invention can be used by the research community for various purposes. The polynucleotides can be used to express recombinant protein for

expressed either constitutively or at a particular stage of

molecular weight markers on Southern gels; as chromosome markers or tags (when labeled) to identify chromosomes or to map related gene positions; to compare with endogenous DNA sequences in patients to identify potential genetic disorders; as probes to hybridize and thus discover novel, related DNA sequences; as a source of information to derive PCR primers for genetic fingerprinting; as a probe to "subtract-out" known sequences in the process of discovering other novel polynucleotides; for selecting and making oligomers for attachment to a "gene chip" or other support, including for examination of expression patterns; to raise anti-protein antibodiesusing DNA immunization techniques; and as an antigen to raise anti-DNA antibodies or elicit another immune response. Where the polynucleotide encodes a protein which binds or potentially binds to another protein (such as, for example, in a receptor-ligand interaction), the polynucleotide can also be used in interaction trap assays (such as, for example, that described in Gyuris et al., Cell 75:791-803 (1993)) to identify polynucleotides encoding the other protein with which binding occurs or to identify inhibitors of the binding interaction.

The proteins provided by the present invention can similarly be used in assay to determine biological activity, including in a panel of multiple proteins for high-throughput

designed to quantitatively determine levels of the protein or

the corresponding protein is preferentially expressed (either constitutively or at a particular stage of tissue differentiation or development or in a disease state); and, of course, to isolate correlative receptors or ligands. Where the protein binds or potentially binds to another protein (such as, for example, in a receptor-ligand interaction), the protein can be used to identify the other protein with which binding occurs or to identify inhibitors of the binding interaction. Proteins involved in these binding interactions can also be used to screen for peptide or small molecule inhibitors or agonists of the binding interaction.

Any or all of these research utilities are capable of being developed into reagent grade or kit format for commercialization as research products.

Methods for performing the uses listed above are well known to those skilled in the art. References disclosing such methods include without limitation "Molecular Cloning: A Laboratory Manual", 2d ed., Cold Spring Harbor Laboratory Press, Sambrook, J., E.F. Fritsch and T. Maniatis eds., 1989, and "Methods in Enzymology: Guide to Molecular Cloning Techniques", Academic Press, Berger, S.L. and A.R. Kimmel eds., 1987.

Nutritional Uses

Polynucleotides and proteins of the present invention can also be used as nutritional sources or supplements. Such uses

used as a source of carbohydrate. In such cases the protein or

particular organism or can be administered as a separate solid or liquid preparation, such as in the form of powder, pills, solutions, suspensions or capsules. In the case of microorganisms, the protein or polynucleotide of the invention can be added to the medium in or on which the microorganism is cultured.

Cytokine and Cell Proliferation/Differentiation Activity

A protein of the present invention may exhibit cytokine, cell proliferation (either inducing or inhibiting) or cell differentiation (either inducing or inhibiting) activity or may induce production of other cytokines in certain cell populations. Many protein factors discovered to date, including all known cytokines, have exhibited activity in one or more factor dependent cell proliferation assays, and hence the assays serve as a convenient confirmation of cytokine activity. The activity of a protein of the present invention is evidenced by any one of a number of routine factor dependent cell proliferation assays for cell lines including, without limitation, 32D, DA2, DA1G, T10, B9, B9/11, BaF3, MC9/G, M+ (preB M+), 2E8, RB5, DA1, 123, T1165, HT2, CTLL2, TF-1, Mo7e and CMK.

The activity of a protein of the invention may, among other means, be measured by the following methods:

Assays for T-cell or thymocyte proliferation include without limitation those described in: Current Protocols in Immunology, Chapter 3, In Vitro assays for Mouse

Humans); Takai et al., J. Immunol. 137:3494-3500, 1986; Bertagnolli et al., J. Immunol. 145:1706-1712, 1990; Bertagnolli et al., Cellular Immunology 133:327-341, 1991; Bertagnolli, et al., J. Immunol. 149:3778-3783, 1992; Bowman et al., J. Immunol. 152: 1756-1761, 1994.

Assays for cytokine production and/or proliferation of spleen cells, lymph node cells or thymocytes include, without limitation, those described in: Polyclonal T cell stimulation, Kruisbeek, A.M. and Shevach, E.M. In Current Protocols in Immunology. J.E.e.a. Coligan eds. Vol 1 pp. 3.12.1-3.12.14, John Wiley and Sons, Toronto. 1994; and Measurement of mouse and human Interferon γ, Schreiber, R.D. In Current Protocols in Immunology. J.E.e.a. Coligan eds. Vol 1 pp. 6.8.1-6.8.8, John Wiley and Sons, Toronto. 1994.

Assays for proliferation and differentiation of hematopoietic and lymphopoietic cells include, without limitation, those described in: Measurement of Human and Murine Interleukin 2 and Interleukin 4, Bottomly, K., Davis, L.S. and Lipsky, P.E. In Current Protocols in Immunology. J.E.e.a. Coligan eds. Vol 1 pp. 6.3.1-6.3.12, John Wiley and Sons, Toronto. 1991; deVries et al., J. Exp. Med. 173:1205-1211, 1991; Moreau et al., Nature 336:690-692, 1988; Greenberger et al., Proc. Natl. Acad. Sci. U.S.A. 80:2931-2938, 1983; Measurement of mouse and human

Toronto. 1991; Smith et al., Proc. Natl. Acad. Sci. U.S.A.

F., Giannotti, J., Clark, S.C. and Turner, K. J. In Current Protocols in Immunology. J.E.e.a. Coligan eds. Vol 1 pp. 6.15.1 John Wiley and Sons, Toronto. 1991; Measurement of mouse and human Interleukin 9 - Ciarletta, A., Giannotti, J., Clark,S.C. and Turner, K.J. In Current Protocols in Immunology. J.E.e.a. Coligan eds. Vol 1 pp. 6.13.1, John Wiley and Sons, Toronto. 1991.

Assays for T-cell clone responses to antigens (which will identify, among others, proteins that affect APC-T cell interactions as well as direct T-cell effects by measuring proliferation and cytokine production) include, without limitation, those described in: Current Protocols in Immunology, Ed by J. E. Coligan, A.M. Kruisbeek, D.H. Margulies, E.M. Shevach, W Strober, Pub. Greene Publishing Associates and Wiley-Interscience (Chapter 3, In Vitro assays for Mouse Lymphocyte Function; Chapter 6, Cytokines and their cellular receptors; Chapter 7, Immunologic studies in Humans); Weinberger et al., Proc. Natl. Acad. Sci. USA 77:6091-6095, 1980; Weinberger et al., Eur. J. Immun. 11:405-411, 1981; Takai et al., J. Immunol. 137:3494-3500, 1986; Takai et al., J. Immunol. 140:508-512, 1988.

Immune Stimulating or Suppressing Activity

A protein of the present invention may also exhibit immune stimulating or immune suppressing activity, including without limitation the activities for which assays are described herein.

Immunodeficiency (SCID , e.g., in regulating up or down growth

the cytolytic activity of NK cells and other cell populations. These immune deficiencies may be genetic or be caused by viral (e.g., HIV) as well as bacterial orfungal infections, or may result from autoimmune disorders. More specifically, infectious diseases causes by viral, bacterial, fungal or other infection may be treatable using a protein of the present invention, including infections by HIV, hepatitis viruses, herpesviruses, mycobacteria, Leishmania spp., malaria spp. and various fungal infections such as candidiasis. Of course, in this regard, a protein of the present invention may also be useful where a boost to the immune system generally may be desirable, i.e., in the treatment of cancer.

Autoimmune disorders which may be treated using a protein of the present invention include, for example, connective tissue disease, multiple sclerosis, systemic lupus erythematosus, rheumatoid arthritis, autoimmune pulmonary inflammation, Guillain-Barre syndrome, autoimmune thyroiditis, insulin dependent diabetes mellitis, myasthenia gravis, graft-versus-host disease and autoimmune inflammatory eye disease. Such a protein of the present invention may also to be useful in the treatment of allergic reactions and conditions, such as asthma (particularly allergic asthma) or other respiratory problems. Other conditions, in which immune suppression is desired

Using the proteins of the invention it may also be possible

be in the form of inhibiting or blocking an immune response already in progress or may involve preventing the induction of an immune response. The functions of activated T cells may be inhibited by suppressing T cell responses or by inducing specific tolerance in T cells, or both. Immunosuppression of T cell responses is generally an active, non-antigen-specific, process which requires continuous exposure of the T cells to the suppressive agent. Tolerance, which involves inducing non-responsiveness or anergy in T cells, is distinguishable from immunosuppression in that it is generally antigen-specific and persists after exposure to the tolerizing agent has ceased. Operationally, tolerance can be demonstrated by the lack of a T cell response upon reexposure to specific antigen in the absence of the tolerizing agent.

Down regulating or preventing one or more antigen functions (including without limitation B lymphocyte antigen functions (such as , for example, B7)), e.g., preventing high level lymphokine synthesis by activated T cells, will be useful in situations of tissue, skin and organ transplantation and in graft-versus-host disease (GVHD). For example, blockage of T cell function should result in reduced tissue destruction in tissue transplantation. Typically, in tissue transplants, rejection of the transplant is initiated through its recognition as foreign by T cells, followed by an immune reaction that destroys the

ligand(s) on immune cells such as a soluble, monomeric form of

monomeric form of a peptide having an activity of another B lymphocyte antigen (e.g., B7-1, B7-3) or blocking antibody, prior to transplantation can lead to the binding of the molecule to the natural ligand(s) on the immune cells without transmitting the corresponding costimulatory signal. Blocking B lymphocyte antigen function in this matter prevents cytokine synthesis by immune cells, such as T cells, and thus acts as an immunosuppressant. Moreover, the lack of costimulation may also be sufficient to anergize the T cells, thereby inducing tolerance in a subject. Induction of long-term tolerance by B lymphocyte antigen-blocking reagents may avoid the necessity of repeated administration of these blocking reagents. To achieve sufficient immunosuppression or tolerance in a subject, it may also be necessary to block the function of a combination of B lymphocyte antigens.

The efficacy of particular blocking reagents in preventing organ transplant rejection or GVHD can be assessed using animal models that are predictive of efficacy in humans. Examples of appropriate systems which can be used include allogeneic cardiac grafts in rats and xenogeneic pancreatic islet cell grafts in mice, both of which have been used to examine the immunosuppressive effects of CTLA4Ig fusion proteins in vivo as described in Lenschow et al., Science 257:789-792 (1992) and Turka et al., Proc. Natl.

York, 1994, pp. 443-447) can be used to determine the effect of

of that disease.

Blocking antigen function may also be therapeutically useful for treating autoimmune diseases. Many autoimmune disorders are the result of inappropriate activation of T cells that are reactive against self tissue and which promote the production of cytokines and autoantibodies involved in the pathology of the diseases. Preventing the activation of autoreactive T cells may reduce or eliminate disease symptoms. Administration of reagents which block costimulation of T cells by disrupting receptor:ligand interactions of B lymphocyte antigens can be used to inhibit T cell activation and prevent production of autoantibodies or T cell-derived cytokines which may be involved in the disease process. Additionally, blocking reagents may induce antigen-specific tolerance of autoreactive T cells which could lead to long-term relief from the disease. The efficacy of blocking reagents in preventing or alleviating autoimmune disorders can be determined using a number of well-characterized animal models of human autoimmune diseases. Examples include murine experimental autoimmune encephalitis, systemic lupus erythmatosis in MRL/lpr/lpr mice or NZB hybrid mice, murine autoimmune collagen arthritis, diabetes mellitus in NOD mice and BB rats, and murine experimental myasthenia gravis (see Paul ed., Fundamental Immunology, Raven Press, New York, 1989,

lymphocyte antigen function, as a means of up-regulating immune

responses may be in the form of enhancing an existing immune response or eliciting an initial immune response. For example, enhancing an immune response through stimulating B lymphocyte antigen function may be useful in cases of viral infection. In addition, systemic viral diseases such as influenza, the commoncold, and encephalitis might be alleviated by the administration of stimulatory forms of B lymphocyte antigens systemically.

Alternatively, anti-viral immune responses may be enhanced in an infected patient by removing T cells from the patient, costimulating the T cells in vitro with viral antigen-pulsed APCs either expressing a peptide of the present invention or together with a stimulatory form of a soluble peptide of the present invention and reintroducing the in vitro activated T cells into the patient. Another method of enhancing anti-viral immune responses would be to isolate infected cells from a patient, transfect them with a nucleic acid encoding a protein of the present invention as described herein such that the cells express all or a portion of the protein on their surface, and reintroduce the transfected cells into the patient. The infected cells would now be capable of delivering a costimulatory signal to, and thereby activate, T cells in vivo.

In another application, up regulation or enhancement of

sarcoma, melanoma, lymphoma, leukemia, neuroblastoma, carcinoma,

the present invention can be administered to a subject to overcome tumor-specific tolerance in the subject. If desired, the tumor cell can be transfected to express a combination of peptides. For example, tumor cells obtained from a patient can be transfected ex vivo with an expression vector directing the expression of a peptide having B7-2-like activity alone, or in conjunction with a peptide having B7-1-like activity and/or B7-3-like activity. The transfected tumor cells are returned to the patient to result in expression of the peptides on the surface of the transfected cell. Alternatively, gene therapy techniques can be used to target a tumor cell for transfection in vivo.

The presence of the peptide of the present invention having the activity of a B lymphocyte antigen(s) on the surface of the tumor cell provides the necessary costimulation signal to T cells to induce a T cell mediated immune response against the transfected tumor cells. In addition, tumor cells which lack MHC class I or MHC class II molecules, or which fail to reexpress sufficient amounts of MHC class I or MHC class II molecules, can be transfected with nucleic acid encoding all or a portion of (e.g., a cytoplasmic-domain truncated portion) of an MHC class I α chain protein and β_2 microglobulin protein or an MHC class IIα chain protein and an MHC class IIβ chain protein to thereby express MHC class I or MHC class II proteins on the cell surface. Expression

B7-1, B7-2, B7-3 induces a T cell mediated immune response against

antisense construct which blocks expression of an MHC class II associated protein, such as the invariant chain, can also be cotransfected with a DNA encoding a peptide having the activity of a B lymphocyte antigen to promote presentation of tumor associated antigens and induce tumor specific immunity. Thus, the induction of a T cell mediated immune response in a human subject may be sufficient to overcome tumor-specific tolerance in the subject.

The activity of a protein of the invention may, among other means, be measured by the following methods:

Suitable assays for thymocyte or splenocyte cytotoxicity include, without limitation, those described in: Current Protocols in Immunology, Ed by J. E. Coligan, A.M. Kruisbeek, D.H. Margulies, E.M. Shevach, W Strober, Pub. Greene Publishing Associates and Wiley-Interscience (Chapter 3, In Vitro assays for Mouse Lymphocyte Function 3.1-3.19; Chapter 7, Immunologic studies in Humans); Herrmann et al., Proc. Natl. Acad. Sci. USA 78:2488-2492, 1981; Herrmann et al., J. Immunol. 128:1968-1974, 1982; Handa et al., J. Immunol. 135:1564-1572, 1985; Takai et al., J. Immunol. 137:3494-3500, 1986; Takai et al., J. Immunol. 140:508-512, 1988; Herrmann et al., Proc. Natl. Acad. Sci. USA 78:2488-2492, 1981; Herrmann et al., J. Immunol. 128:1968-1974, 1982; Handa et al., J. Immunol. 135:1564-1572, 1985; Takai et al.,

Bertagnolli et al., Journal Immunology 146:3952-3941, 1991; Brown

Assays for T-cell-dependent immunoglobulin responses and isotype switching (which will identify, among others, proteins that modulate T-cell dependent antibody responses and that affect Th1/Th2 profiles) include, without limitation, those described in: Maliszewski, J. Immunol. 144:3028-3033, 1990; and Assays for B cell function: In vitro antibody production, Mond, J.J. and Brunswick, M. In Current Protocols in Immunology. J.E.e.a. Coligan eds. Vol 1 pp. 3.8.1-3.8.16, John Wiley and Sons, Toronto. 1994.

Mixed lymphocyte reaction (MLR) assays (which will identify, among others, proteins that generate predominantly Th1 and CTL responses) include, without limitation, those described in: Current Protocols in Immunology, Ed by J. E. Coligan, A.M. Kruisbeek, D.H. Margulies, E.M. Shevach, W Strober, Pub. Greene Publishing Associates and Wiley-Interscience (Chapter 3, In Vitro assays for Mouse Lymphocyte Function 3.1-3.19; Chapter 7, Immunologic studies in Humans); Takai et al., J. Immunol. 137:3494-3500, 1986; Takai et al., J. Immunol. 140:508-512, 1988; Bertagnolli et al., J. Immunol. 149:3778-3783, 1992.

Dendritic cell-dependent assays (which will identify, among others, proteins expressed by dendritic cells that activate naive T-cells) include, without limitation, those described in: Guery et al., J. Immunol. 134:536-544, 1995; Inaba et al., Journal of Experimental Medicine 173:549-559, 1991; Macatonia et al., [illegible]

Medicine 169:1255-1264, 1989; Bhardwaj et al., Journal of Clinical Investigation 94:797-807, 1994; and Inaba et al., Journal of Experimental Medicine 172:631-640, 1990.

Assays for lymphocyte survival/apoptosis (which will identify, among others, proteins that prevent apoptosis after superantigen induction and proteins that regulate lymphocyte homeostasis) include, without limitation, those described in: Darzynkiewicz et al., Cytometry 13:795-808, 1992; Gorczyca et al., Leukemia 7:659-670, 1993; Gorczyca et al., Cancer Research 53:1945-1951, 1993; Itoh et al., Cell 66:233-243, 1991; Zacharchuk, Journal of Immunology 145:4037-4045, 1990; Zamai et al., Cytometry 14:891-897, 1993; Gorczyca et al., International Journal of Oncology 1:639-648, 1992.

Assays for proteins that influence early steps of T-cell commitment and development include, without limitation, those described in: Antica et al., Blood 84:111-117, 1994; Fine et al., Cellular Immunology 155:111-122, 1994; Galy et al., Blood 85:2770-2778, 1995; Toki et al., Proc. Nat. Acad Sci. USA 88:7548-7551, 1991.

Hematopoiesis Regulating Activity

A protein of the present invention may be useful in regulation of hematopoiesis and, consequently, in the treatment of myeloid or lymphoid cell deficiencies. Even marginal

hematopoiesis, e.g. in supporting the growth and proliferation

cytokines, thereby indicating utility, for example, in treating various anemias or for use in conjunction with irradiation/chemotherapy to stimulate the production of erythroid precursors and/or erythroid cells; in supporting the growth and proliferation of myeloid cells such as granulocytes and monocytes/macrophages (i.e., traditional CSF activity) useful, for example, in conjunction with chemotherapy to prevent or treat consequent myelo-suppression; in supporting the growth and proliferation of megakaryocytes and consequently of platelets thereby allowing prevention or treatment of various platelet disorders such as thrombocytopenia, and generally for use in place of or complimentary to platelet transfusions; and/or in supporting the growth and proliferation of hematopoietic stem cells which are capable of maturing to any and all of the above-mentioned hematopoietic cells and therefore find therapeutic utility in various stem cell disorders (such as those usually treated with transplantation, including, without limitation, aplastic anemia and paroxysmal nocturnal hemoglobinuria), as well as in repopulating the stem cell compartment post irradiation/chemotherapy, either in-vivo or ex-vivo (i.e., in conjunction with bone marrow transplantation or with peripheral progenitor cell transplantation (homologous or heterologous)) as normal cells or genetically manipulated for gene therapy.

Suitable assays for proliferation and differentiation of

Assays for embryonic stem cell differentiation (which will identify, among others, proteins that influence embryonic differentiation hematopoiesis) include, without limitation, those described in: Johansson et al. Cellular Biology 15:141-151, 1995; Keller et al., Molecular and Cellular Biology 13:473-486, 1993; McClanahan et al., Blood 81:2903-2915, 1993.

Assays for stem cell survival and differentiation (which will identify, among others, proteins that regulate lympho-hematopoiesis) include, without limitation, those described in: Methylcellulose colony forming assays, Freshney, M.G. In Culture of Hematopoietic Cells. R.I. Freshney, et al. eds. Vol pp. 265-268, Wiley-Liss, Inc., New York, NY. 1994; Hirayama et al., Proc. Natl. Acad. Sci. USA 89:5907-5911, 1992; Primitive hematopoietic colony forming cells with high proliferative potential, McNiece, I.K. and Briddell, R.A. In Culture of Hematopoietic Cells. R.I. Freshney, et al. eds. Vol pp. 23-39, Wiley-Liss, Inc., New York, NY. 1994; Neben et al., Experimental Hematology 22:353-359, 1994; Cobblestone area forming cell assay, Ploemacher, R.E. In Culture of Hematopoietic Cells. R.I. Freshney, et al. eds. Vol pp. 1-21, Wiley-Liss, Inc., New York, NY. 1994; Long term bone marrow cultures in the presence of stromal cells, Spooncer, E., Dexter, M. and Allen, T. In Culture of Hematopoietic Cells. R.I. Freshney, et al. eds. Vol pp. 163-179, Wiley-Liss, Inc., New York, NY. 1994;

pp. 181-182, Wiley-Liss, Inc., New York, NY. 1994.

A protein of the present invention also may have utility in compositions used for bone, cartilage, tendon, ligament and/or nerve tissue growth or regeneration, as well as for wound healing and tissue repair and replacement, and in the treatment of burns, incisions and ulcers.

A protein of the present invention, which induces cartilage and/or bone growth in circumstances where bone is not normally formed, has application in the healing of bone fractures and cartilage damage or defects in humans and other animals. Such a preparation employing a protein of the invention may have prophylactic use in closed as well as open fracture reduction and also in the improved fixation of artificial joints. De novo bone formation induced by an osteogenic agent contributes to the repair of congenital, trauma induced, or oncologic resection induced craniofacial defects, and also is useful in cosmetic plastic surgery.

A protein of this invention may also be used in the treatment of periodontal disease, and in other tooth repair processes. Such agents may provide an environment to attract bone-forming cells, stimulate growth of bone-forming cells or induce differentiation of progenitors of bone-forming cells. A protein of the invention may also be useful in the treatment of osteoporosis or osteoarthritis, such as through stimulation of bone and/or

etc. mediated by inflammatory processes.

be attributable to the protein of the present invention is tendon/ligament formation. A protein of the present invention, which induces tendon/ligament-like tissue or other tissue formation in circumstances where such tissue is not normally formed, has application in the healing of tendon or ligament tears, deformities and other tendon or ligament defects in humans and other animals. Such a preparation employing a tendon/ligament-like tissue inducing protein may have prophylactic use in preventing damage to tendon or ligament tissue, as well as use in the improved fixation of tendon or ligament to bone or other tissues, and in repairing defects to tendon or ligament tissue. De novo tendon/ligament-like tissue formation induced by a composition of the present invention contributes to the repair of congenital, trauma induced, or other tendon or ligament defects of other origin, and is also useful in cosmetic plastic surgery for attachment or repair of tendons or ligaments. The compositions of the present invention may provide an environment to attract tendon or ligament-forming cells, stimulate growth of tendon- or ligament-forming cells, induce differentiation of progenitors of tendon- or ligament-forming cells, or induce growth of tendon/ligament cells or progenitors ex vivo for return in vivo to effect tissue repair. The compositions of the invention may also be useful in the treatment

and a sequestering agent, as a carrier, as is well known in the

The protein of the present invention may also be useful for proliferation of neural cells and for regeneration of nerve and brain tissue, i.e. for the treatment of central and peripheral nervous system diseases and neuropathies, as well as mechanical and traumatic disorders, which involve degeneration, death or trauma to neural cells or nerve tissue. More specifically, a protein may be used in the treatment of diseases of the peripheral nervous system, such as peripheral nerve injuries, peripheral neuropathy and localized neuropathies, and central nervous system diseases, such as Alzheimer's, Parkinson's disease, Huntington's disease, amyotrophic lateral sclerosis, and Shy-Drager syndrome. Further conditions which may be treated in accordance with the present invention include mechanical and traumatic disorders, such as spinal cord disorders, head trauma and cerebrovascular diseases such as stroke. Peripheral neuropathies resulting from chemotherapy or other medical therapies may also be treatable using a protein of the invention.

Proteins of the invention may also be useful to promote better or faster closure of non-healing wounds, including without limitation pressure ulcers, ulcers associated with vascular insufficiency, surgical and traumatic wounds, and the like.

It is expected that a protein of the present invention may also exhibit activity for generation or regeneration of other

[illegible] cardiac and vascular [illegible] vascular endothelium tissue,

of the desired effects may be by inhibition or modulation of fibrotic scarring to allow normal tissue to regenerate. A protein of the invention may also exhibit angiogenic activity.

A protein of the present invention may also be useful for gut protection or regeneration and treatment of lung or liver fibrosis, reperfusion injury in various tissues, and conditions resulting from systemic cytokine damage.

A protein of the present invention may also be useful for promoting or inhibiting differentiation of tissues described above from precursor tissues or cells; or for inhibiting the growth of tissues described above.

The activity of a protein of the invention may, among other means, be measured by the following methods:

Assays for tissue generation activity include, without limitation, those described in: International Patent Publication No. WO95/16035 (bone, cartilage, tendon); International Patent Publication No. WO95/05846 (nerve, neuronal); International Patent Publication No. WO91/07491 (skin, endothelium).

Assays for wound healing activity include, without limitation, those described in: Winter, Epidermal Wound Healing, pps. 71-112 (Maibach, HI and Rovee, DT, eds., Year Book Medical Publishers, Inc., Chicago, as modified by Eaglstein and Mertz, J. Invest. Dermatol 71:382-84 (1978).

Inhibin-related activities. Inhibins are characterized by

hormone (FSH), while activins and are characterized by their ability to stimulate the release of follicle stimulating hormone (FSH). Thus, a protein of the present invention, alone or in heterodimers with a member of the inhibin α family, may be useful as a contraceptive based on the ability of inhibins to decrease fertility in female mammals and decrease spermatogenesis in male mammals. Administration of sufficient amounts of other inhibins can induce infertility in these mammals. Alternatively, the protein of the invention, as a homodimer or as a heterodimer with other protein subunits of the inhibin-β group, may be useful as a fertility inducing therapeutic, based upon the ability of activin molecules in stimulating FSH release from cells of the anterior pituitary. See, for example, United States Patent 4,798,885. A protein of the invention may also be useful for advancement of the onset of fertility in sexually immature mammals, so as to increase the lifetime reproductive performance of domestic animals such as cows, sheep and pigs.

The activity of a protein of the invention may, among other means, be measured by the following methods:

Assays for activin/inhibin activity include, without limitation, those described in: Vale et al., Endocrinology 91:562-572, 1972; Ling et al., Nature 321:779-782, 1986; Vale et al., Nature 321:776-779, 1986; Mason et al., Nature 318:659-663,

A protein of the present invention may have chemotactic

cells, including, for example, monocytes, fibroblasts, neutrophils, T-cells, mast cells, eosinophils, epithelial and/or endothelial cells. Chemotactic and chemokinetic proteins can be used to mobilize or attract a desired cell population to a desired site of action. Chemotactic or chemokinetic proteins provide particular advantages in treatment of wounds and other trauma to tissues, as well as in treatment of localized infections. For example, attraction of lymphocytes, monocytes or neutrophils to tumors or sites of infection may result in improved immune responses against the tumor or infecting agent.

A protein or peptide has chemotactic activity for a particular cell population if it can stimulate, directly or indirectly, the directed orientation or movement of such cell population. Preferably, the protein or peptide has the ability to directly stimulate directed movement of cells. Whether a particular protein has chemotactic activity for a population of cells can be readily determined by employing such protein or peptide in any known assay for cell chemotaxis.

The activity of a protein of the invention may, among other means, be measured by the following methods:

Assays for chemotactic activity (which will identify proteins that induce or prevent chemotaxis) consist of assays that measure the ability of a protein to induce the migration of cells

Suitable assays for movement and adhesion include, without

Ed by J.E. Coligan, A.M. Kruisbeek, D.H. Margulies, E.M. Shevach, W.Strober, Pub. Greene Publishing Associates and Wiley-Interscience (Chapter 6.12, Measurement of alpha and beta Chemokines 6.12.1-6.12.28; Taub et al. J. Clin. Invest. 95:1370-1376, 1995; Lind et al. APMIS 103:140-146, 1995; Muller et al Eur. J. Immunol. 25: 1744-1748; Gruber et al. J. of Immunol. 152:5860-5867, 1994; Johnston et al. J. of Immunol. 153: 1762-1768, 1994.

Hemostatic and Thrombolytic Activity

A protein of the invention may also exhibit hemostatic or thrombolytic activity. As a result, such a protein is expected to be useful in treatment of various coagulation disorders (includinghereditary disorders, such as hemophilias) or to enhance coagulation and other hemostatic events in treating wounds resulting from trauma, surgery or other causes. A protein of the invention may also be useful for dissolving or inhibiting formation of thromboses and for treatment and prevention of conditions resulting therefrom (such as, for example, infarction of cardiac and central nervous system vessels (e.g., stroke).

The activity of a protein of the invention may, among other means, be measured by the following methods:

Assay for hemostatic and thrombolytic activity include, without limitation, those described in: Linet et al., J. Clin.

Chem. Clin. Biochem. Vol. 28, pp. 279-283, 1990.

A protein of the present invention may also demonstrate activity as receptors, receptor ligands or inhibitors or agonists of receptor/ligand interactions. Examples of such receptors and ligands include, without limitation, cytokine receptors and their ligands, receptor kinases and their ligands, receptor phosphatases and their ligands, receptors involved in cell-cell interactions and their ligands (including without limitation, cellular adhesion molecules (such as selectins, integrins and their ligands) and receptor/ligand pairs involved in antigen presentation, antigen recognition and development of cellular and humoral immune responses). Receptors and ligands are also useful for screening of potential peptide or small molecule inhibitors of the relevant receptor/ligand interaction. A protein of the present invention (including, without limitation, fragments of receptors and ligands) may themselves be useful as inhibitors of receptor/ligand interactions.

The activity of a protein of the invention may, among other means, be measured by the following methods:

Suitable assays for receptor-ligand activity include without limitation those described in:Current Protocols in Immunology, Ed by J.E. Coligan, A.M. Kruisbeek, D.H. Margulies, E.M. Shevach, W.Strober, Pub. Greene Publishing Associates and Wiley-Interscience Chapter 7.28, Measurement of Cellular

J. Exp. Med. 167:1233-1250, 1988; Brasel et al., J. Exp. Med.

175:59-68, 1994; Stitt et al., Cell 80:661-670, 1995.

Anti-Inflammatory Activity

Proteins of the present invention may also exhibit anti-inflammatory activity. The anti-inflammatory activity may be achieved by providing a stimulus to cells involved in the inflammatory response, by inhibiting or promoting cell-cell interactions (such as, for example, cell adhesion), by inhibiting or promoting chemotaxis of cells involved in the inflammatory process, inhibiting or promoting cell extravasation, or by stimulating or suppressing production of other factors which more directly inhibit or promote an inflammatory response. Proteins exhibiting such activities can be used to treat inflammatory conditions including chronic or acute conditions), including without limitation inflammation associated with infection (such as septic shock, sepsis or systemic inflammatory response syndrome (SIRS)), ischemia-reperfusion injury, endotoxin lethality, arthritis, complement-mediated hyperacute rejection, nephritis, cytokine or chemokine-induced lung injury, inflammatory bowel disease, Crohn's disease or resulting from over production of cytokines such as TNF or IL-1. Proteins of the invention may also be useful to treat anaphylaxis and hypersensitivity to an antigenic substance or material.

Tumor Inhibition Activity

Immune system treatment or prevention of tumors, a protein of the

inhibit tumor growth directly or indirectly (such as, for example, via ADCC). A protein may exhibit its tumor inhibitory activity by acting on tumor tissue or tumor precursor tissue, by inhibiting formation of tissues necessary to support tumor growth (such as, for example, by inhibiting angiogenesis), by causing production of other factors, agents or cell types which inhibit tumor growth, or by suppressing, eliminating or inhibiting factors, agents or cell types which promote tumor growth

Other Activities

A protein of the invention may also exhibit one or more of the following additional activities or effects: inhibiting the growth, infection or function of, or killing, infectious agents, including, without limitation, bacteria, viruses, fungi and other parasites; effecting (suppressing or enhancing) bodily characteristics, including, without limitation, height, weight, hair color, eye color, skin, fat to lean ratio or other tissue pigmentation, or organ or body part size or shape (such as, for example, breast augmentation or diminution, change in bone form or shape); effecting biorhythms or caricadic cycles or rhythms; effecting the fertility of male or female subjects; effecting the metabolism, catabolism, anabolism, processing, utilization, storage or elimination of dietary fat, lipid, protein, carbohydrate, vitamins, minerals, cofactors or other nutritional factors or substances;

cognitive disorders, depression including depressive disorders,

and violent behaviors; providing analgesic effects or other pain reducing effects; promoting differentiation and growth of embryonic stem cells in lineages other than hematopoietic lineages; hormonal or endocrine activity; in the case of enzymes, correcting deficiencies of the enzyme and treating deficiency-related diseases; treatment of hyperproliferative disorders (such as, for example, psoriasis); immunoglobulin-like activity (such as, for example, the ability to bind antigens or complement); and the ability to act as an antigen in a vaccine composition to raise an immune response against such protein or another material or entity which is cross-reactive with such protein.

Examples

The present invention is embodied in more detail by the following examples, but this embodiment is not intended to restrict the present invention. The basic operations and the enzyme reactions with regard to the DNA recombination are carried out according to the literature ["Molecular Cloning. A Laboratory Manual", Cold Spring Harbor Laboratory, 1989]. Unless otherwise stated, restrictive enzymes and a variety of modification enzymes to be used were those available from TAKARA SHUZO. The manufacturer's instructions were used for the buffer compositions as well as for the reaction conditions, in each of the enzyme

1. Preparation of Poly-A$^+$ RNA

stimulated by phorbol ester, tissues of stomach cancer delivered by the operation, and the liver were used for human cells to extract mRNAs. The cell line was incubated by a conventional procedure.

After about 1 g of the human cells was homogenized in 20 ml of a 5.5 M guanidinium thiocyanate solution, a total mRNA was prepared according to the literature [Okayama, H. et al., "Method in Enzymology", Vol. 164, Academic Press, 1987]. This was subjected to chromatography on oligo(dT)-cellulose column washed with a 20 mM Tris-hydrochloride buffer solution (pH 7.6), 0.5 M NaCl, and 1 mM EDTA to obtain a poly(A)$^+$ RNA according to the above-described literature.

(2) Construction of cDNA Library

Ten micrograms of the above-mentioned poly(A)$^+$ RNA were dissolved in a 100 mM Tris-hydrochloride buffer solution (pH 8), one unit of an RNase-free, bacterial alkaline phosphatase was added, and the reaction was run at 37°C for one hour. After the reaction solution was subjected to phenol extraction, followed by ethanol precipitation, the resulting pellet was dissolved in a solution containing 50 mM sodium acetate (pH 6), 1 mM EDTA, 0.1 M 2-mercaptoethanol, and 0.01 % Triton X-100. Thereto was added one unit of a tobacco-origin acid pyrophosphatase (Epicentre Technologies) and a total 100 µl volume of the resulting mixture was reacted at 37°C for one hour. After the reaction solution was

to obtain a decapped poly A$^+$ RNA.

RNA oligonucleotide (5'-dG-dG-dG-dG-dA-dA-dT-dT-dC-dG-dA-G-G-A-3') were dissolved in a solution containing 50 mM Tris-hydrochloride buffer solution (pH 7.5), 0.5 mM ATP, 5 mM $MgCl_2$, 10 mM 2-mercaptoethanol, and 25% polyethylene glycol, whereto was added 50 units of T4RNA ligase and a total 30 µl volume of the resulting mixture was reacted at 20°C for 12 hours. After the reaction solution was subjected to phenol extraction, followed by ethanol precipitation, the resulting pellet was dissolved in water to obtain a chimeric-oligo-capped poly(A)$^+$ RNA.

After digestion of vector pKA1 (Japanese Patent Kokai Publication No. 1992-117292) developed by the present inventors with KpnI, about 60 dT tails were added using a terminal transferase. A vector primer to be used below was prepared by digestion of this product with EcoRV to remove a dT tail at one side.

After 6 µg of the previously-prepared chimeric-oligo-capped poly(A)$^+$ RNA was annealed with 1.2 µg of the vector primer, the resulting product was dissolved in a solution containing 50 mM Tris-hydrochloride buffer solution (pH 8.3), 75 mM KCl, 3 mM $MgCl_2$, 10 mM dithiothreitol, and 1.25 mM dNTP (dATP + dCTP + dGTP + dTTP), 200 units of a reverse transcriptase (GIBCO-BRL) were added, and the reaction in a total 20 µl volume was run at 42°C for one hour. After the reaction solution was subjected to phenol extraction, followed by ethanol precipitation, the resulting

and 1 mM dithiothreitol. Thereto were added 10 units of EcoRI

37℃ for one hour. After the reaction solution was subjected to phenol extraction, followed by ethanol precipitation, the resulting pellet was dissolved in a solution containing 20 mM Tris-hydrochloride buffer solution (pH 7.5), 100 mM KCl, 4 mM $MgCl_2$, 10 mM $(NH_4)_2SO_4$, and 50 μg/ml of the bovine serum albumin. Thereto were added 60 units of an *Escherichia coli* DNA ligase and the resulting mixture was reacted at 16℃ for 16 hours. To the reaction solution were added 2 μl of 2 mM dNTP, 4 units of *Escherichia coli* DNA polymerase I, and 0.1 unit of *Escherichia coli* RNase H and the resulting mixture was reacted at 12℃ for one hour and then at 22℃ for one hour.

Next, the cDNA-synthesis reaction solution was used for transformation of *Escherichia coli* DH12S (GIBCO-BRL). The transformation was carried out by the electroporation method. A portion of the transformant was sprayed on the 2xYT agar culture medium containing 100 μg/ml ampicillin and the mixture was incubated at 37℃ overnight. A colony formed on the agar medium was picked up at random and inoculated on 2 ml of the 2xYT culture medium containing 100 μg/ml ampicillin. After incubation at 37℃ overnight, the culture mixture was centrifuged to separate the mycelia, from which a plasmid DNA was prepared by the alkaline lysis method. The plasmid DNA was subjected to double digestion with EcoRI and NotI, followed by 0.8 agarose gel electrophoresis,

carried out by using an M13 universal primer labeled with a

and then the product was examined with a fluorescent DNA sequencer (Applied Biosystems) to determine an about 400-bp base sequence at the 5'-terminus of the cDNA. The sequence data were filed as the homo/protein cDNA bank database.

(3) Selection of cDNAs Encoding Proteins Having Transmembrane Domains

A base sequence registered in the homo/protein cDNA bank was converted to three frames of amino acid sequences and the presence or absence of an open reading frame (ORF) beginning from the initiation codon was examined. Then, the selection was made for the presence of a signal sequence that is characteristic to a secretory protein at the N-terminus of the portion encoded by the ORF. These clones were sequenced from the both 5' and 3' directions by the use of the deletion method using exonuclease III to determine the whole base sequence. The hydrophobicity/hydrophilicity profiles were obtained for proteins encoded by the ORF by the Kyte-Doolittle method [Kyte, J. & Doolittle, R. F., J. Mol. Biol. 157: 105-132 (1982)] to examine the presence or absence of a hydrophobic region. In the case in which there is a hydrophobic region of a putative transmembrane domain in the amino acid sequence of an encoded protein, this protein was judged as a membrane protein.

(4) Functional Verification of Secretory Signal Sequence or

[Tokiyama-Kobayashi, M. et al., Gene 156: 141-145 (1995)] that

candidate obtained in the above-mentioned steps functions as a secretory signal sequence. First, the plasmid containing the target cDNA was cleaved at an appropriate restriction enzyme site existing at the downstream of the portion expected for encoding the secretory signal sequence. In the case in which this restriction site was a protruding terminus, the site was blunt-ended by the Klenow treatment or treatment with the mung-bean nuclease. Digestion with HindIII was further carried out and a DNA fragment containing the SV40 promoter and a cDNA encoding the secretory signal sequence at the downstream of the promoter was separated by agarose gel electrophoresis. The resulting fragment was inserted between HindIII in pSSD3 (DDBJ/EMBL/GenBank Registration No. AB007632) and a restriction enzyme site selected so as to match with the urokinase-coding frame, thereby constructing a vector expressing a fusion protein of the secretory signal sequence of the target cDNA and the urokinase protease domain.

After *Escherichia coli* (host: JM109) bearing the fusion-protein expression vector was incubated at 37°C for 2 hours in 2 ml of the 2xYT culture medium containing 100 μg/ml of ampicillin, the helper phage M13KO7 (50 μl) was added and the incubation was continued at 37°C overnight. A supernatant separated by centrifugation underwent precipitation with

PEG-NaCl. Also, there were used as controls suspensions of

pSSD3 and from the vector pKA1-UPA containing a full-length cDNA of urokinase [Yokoyama-Kobayashi, M. et al., Gene 163: 193-196 (1995)].

The culture cells originating from the simian kidney, COS7, were incubated at 37℃ in the presence of 5% CO_2 in the Dulbecco's modified Eagle's culture medium (DMEM) containing 10% fetal calf albumin. Into a 6-well plate (Nunc Inc., 3 cm in the well diameter) were inoculated 1×10^5 COS7 cells and incubation was carried out at 37℃ for 22 hours in the presence of 5% CO_2. After the culture medium was removed, the cell surface was washed with a phosphate buffer solution and then washed again with DMEM containing 50 mM Tris-hydrochloric acid (pH 7.5) (TDMEM). To the resulting cells was added a suspension of 1 μl of the single-stranded phage suspension, 0.6 ml of the DMEM culture medium, and 3 μl of TRANSFECTAM™ (IBF Inc.) and the resulting mixture was incubated at 37℃ for 3 hours in the presence of 5% CO_2. After the sample solution was removed, the cell surface was washed with TDMEM, 2 ml per well of DMEM containing 10% fetal calf albumin was added, and the incubation was carried out at 37℃ for 2 days in the presence of 5% CO_2.

To 10 ml of 50 mM phosphate buffer solution (pH 7.4) containing 2% bovine fibrinogen (Miles Inc., 0.5% agarose, and 1 mM calcium chloride were added 1 units of human thrombin (Mochida

Next, 1 ml of the culture supernatant of the transfected "COS"

37℃ for 15 hours. In the case in which a clear circle appears on the fibrin plate, it is judged that the cDNA fragment codes for the amino acid sequence functioning as a secretory signal sequence. On the other hand, in case in which a clear circle is not formed, the cells were washed well, then the fibrin sheet was placed on the cells, and incubation was carried out at 37℃ for 15 hours. In case in which a clear portion is formed on the fibrin sheet, it indicates that the urokinase activity was expressed on the cell surface. In other words, the cDNA fragment is judged to code for the transmembrane domains.

(5) Protein Synthesis by In Vitro Translation

The plasmid vector bearing the cDNA of the present invention was used for in vitro transcription/translation with a TNT rabbit reticulocyte lysate kit (Promega). In this case, [^{35}S]methionine was added to label the expression product with a radioisotope. Each of the reactions was carried out according to the protocols attached to the kit. Two micrograms of the plasmid was reacted at 30℃ for 90 minutes in a total 25 μl volume of the reaction solution containing 12.5 μl of TNT rabbit reticulocyte lysate, 0.5 μl of a buffer solution (attached to kit), 2 μl of an amino acid mixture (methionine-free), 2 μl of [^{35}S]methionine (Amersham) (0.37 MBq/μl), 0.5 μl of T7RNA polymerase, and 20 U of RNasin. To 3 μl of the resulting reaction solution was added 2 μl of the

and 3 μl glycerol, and the resulting mixture was heated at 95℃

electrophoresis. The molecular weight of the translation product was determined by carrying out the autoradiograph.

(6) Expression by COS7

Escherichia coli bearing the expression vector of the protein of the present invention was infected with helper phage M13KO7 and single-stranded phage particles were obtained by the above-mentioned procedure. The thus-obtained phage was used for introducing each expression vector in the culture cells originating from the simian kidney, COS7. After incubation at 37°C for 2 days in the presence of 5% CO_2, the incubation was continued for one hour in the culture medium containing [^{35}S]cystine or [^{35}S]methionine. Collection and dissolution of the cells, followed by subjecting to SDS-PAGE, allowed to observe the presence of a band corresponding to the expression product of each protein, on the membrane fraction which did not exist in the COS7 cells. For instance, the molecular weights of HP01498, HP01565, HP01737, HP010435 and HP010495 were respectively 20 kDa, 13 kDa, 52 kDa, 33 kDa and 20 kDa.

(7) Clone Examples

HP01244 (Sequence Nos. 1, 11, and 21)

Determination of the whole base sequence of the cDNA insert of clone HP01244 obtained from cDNA libraries of human stomach cancer revealed the structure consisting of a 15-bp 5'-

12 amino acid residues and there existed a signal-like sequence

Figure 1 depicts the hydrophobicity/hydrophilicity profile, obtained by the Kyte-Doolittle method, of the present protein. In vitro translation resulted in formation of a translation product of 14 kDa that was almost consistent with the molecular weight of 12,911 predicted from the ORF.

The search of the protein data base by using the amino acid sequence of the present protein revealed that the protein was analogous to the chicken stem cell antigen 2 (GenBank Accession No. L34554). Table 2 shows the comparison of the amino acid sequence between the human protein of the present invention (HP) and the chicken stem cell antigen 2 (GG). Therein, the marks of -, *, and . represent a gap, an amino acid residue identical with the protein of the present invention, and an amino acid residue analogous to the protein of the present invention, respectively. The both proteins possessed a homology of 33.9% in the entire region.

Table 2

```
HS MKAVLLALLMAGLALQPGTALLCYSCKAQVSNEDCLQVKNCTQLGEQCWTA--RIRAVGL
   *** *.*.* * * .... .*.*.**... ** .**   .*.. .*.* *.   .   *
GG MKAFLFAVLAAVLCVERAHTLICFSCSDASSNWACLTPVKCAENEEHCVTTYVGVGTGGK
HS LT-VISKGCSLNCVDDSQDYYVGKKNITCCDTDLCNASGAHALQPAAATLAL--LPALGL
   .  ****** * ... .  ..  .. ***. *** **. ..... *.***  * ..
GG SGQSISKGCSPVCPSAGINLGIAAAASVYCCDSFLCNISGSSSVKASYAVLALGILVSFVY
HS LLWGPGQL
   .*..
```

Furthermore, the search of the GenBank using the base

sequences that possessed a homology of 90% or more (for example, Accession No. AA476643) in EST, but many sequences were not distinct and the same ORF as that in the present cDNA was not found. <HP01498> (Sequence Nos. 2, 12, and 23)

Determination of the whole base sequence of the cDNA insert of clone HP01498 obtained from cDNA libraries of human stomach cancer revealed the structure consisting of a 227-bp 5'-nontranslation region, a 663-bp ORF, and a 389-bp 3'-nontranslation region. The ORF codes for a protein consisting of 220 amino acid residues and there existed four transmembrane domains. Figure 2 depicts the hydrophobicity/hydrophilicity profile, obtained by the Kyte-Doolittle method, of the present protein. In vitro translation resulted in formation of a translation product of 22 kDa that was almost consistent with the molecular weight of 23,318 predicted from the ORF.

The search of the protein data base by using the amino acid sequence of the present protein revealed that the protein was analogous to the rat protein RVP1 (NBRF Accession No. A39484). Table 3 shows the comparison of the amino acid sequence between the human protein of the present invention (HP) and the rat protein RVP1(RN). Therein, the marks of -, *, and . represent a gap, an amino acid residue identical with the protein of the present invention, and an amino acid residue analogous to the protein of

had a sequence longer by 6 amino acid residues at the N-terminal

Table 3

```
HS MSMGLEITGTALAVLGWLGTIVCCALPMWRVSAFIGSNIITSQNIWEGLWMNCVVQSTGQ
   ***. ******. ******* ******************. ***. * . ******** ******
RN MSMSLEITGTSLAVLGWLCTIVCCALPMWRVSAFIGSSIITAQITWEGLWMNC-VQSTGQ
HS MQCKVYDSLLALPQDLQAARALIVVAILLAAFGLLVALVGAQCTNCVQDDTAKAKITIVA
   ****. ********************. ************************. **********
RN MQCKMYDSLLALPQDLQAARALIVVSILLAAFGLLVALVGAQCTNCVQDETAKAKITIVA
HS GVLFLLAALLTLVPVSWSANTIIRDFYNPVVPEAQKREMGAGLYVGWAAAALQLLGGALL
   ********. ********************. **********. ******************
RN GVLFLLAAVLTLVPVSWSANTIIRDFYNPLVPEAQKREMGTGLYVGWAAAALQLLGGALL
HS CCSCPPREKKYTATKVVYSAPRSTGPGASLGTGYDRKDYV
   ******** **. . **. . **********. .  **. ****
RN CCSCPPRE-KYAPTKILYSAPRSTGPGTGTGTAYDRKTTSERPGARTPHHHHYQPSMYPT
```

Furthermore, the search of the GenBank using the base sequences of the present cDNA has revealed the presence of sequences that possessed a homology of 90% or more (for example, Accession No. H72008) in EST, but many sequences were not distinct and the same ORF as that in the present cDNA was not found.

The rat protein RVP1 is one of membrane proteins which are induced by androgen withdrawal and apoptosis in the rat ventral prostate [Briehl, M. M. et al., Mol. Endocrinol. 5: 1381-1388 (1991)]. Accordingly, the present protein is considered to play an important role in the signal transduction that is associated

Determination of the whole base sequence of the cDNA insert

cancer revealed the structure consisting of a 62-bp 5'-nontranslation region, a 246-bp ORF, and a 527-bp 3'-nontranslation region. The ORF codes for a protein consisting of 81 amino acid residues and there existed two transmembrane domains. Figure 3 depicts the hydrophobicity/hydrophilicity profile, obtained by the Kyte-Doolittle method, of the present protein. In vitro translation resulted in formation of a translation product of 10 kDa that was almost consistent with the molecular weight of 9,374 predicted from the ORF.

The search of the protein data base using the amino acid sequence of the present protein has revealed the presence of sequences that were analogous to the nematode putative protein F49C12.13 (GenBank Accession No. Z68227). Table 4 shows the comparison of the amino acid sequence between the human protein of the present invention (HP) and the nematode putative protein F49C12.13 (CE). Therein, the marks of -, *, and . represent a gap, an amino acid residue identical with the protein of the present invention, and an amino acid residue analogous to the protein of the present invention, respectively. The both proteins possessed a homology of 47.4 % in the entire region.

Table 4

```
HS          MAYHGLTVPLIVMSVFWGFVGFLVPWFIPKGPNRGVIITMLVTCSVCCYLFWL
                 *. .**. .*.**...** **..*******.* *.. .***..**.
CE MCNFSYFQLQMGILIPLVSVSAFWAIIGFGGPWIVPKGPNRGIIQLMIIMTAVCCWMFWI
HS IAILAQLNPLFGPQLKNETIWYLKYHWP
   ...* *****.***.. .**.... .*
CE MVFLHQLNPLIGPQINVKTIRWISEKWGDAPNVIXX
```

Furthermore, the search of the GenBank using the base sequences of the present cDNA has revealed the presence of sequences that possessed a homology of 90% or more (for example, Accession No. N57319) in EST, but, since they are partial sequences, it can not be judged whether or not any of these sequences codes for the same protein as the protein of the present invention.

<HP01606> (Sequence Nos. 4, 14, and 27)

Determination of the whole base sequence of the cDNA insert of clone HP01606 obtained from cDNA libraries of human stomach cancer revealed the structure consisting of a 124-bp 5'-nontranslation region, a 906-bp ORF, and a 224-bp 3'-nontranslation region. The ORF codes for a protein consisting of 301 amino acid residues and there existed seven transmembrane domains. Figure 4 depicts the hydrophobicity/hydrophilicity profile, obtained by the Kyte-Doolittle method, of the present

Molecular weight [illegible] predicted from the ORF.

sequence of the present protein has revealed the presence of sequences that were analogous to the nematode putative protein F13H11.3 (GenBank Accession No. AF003389). Table 5 shows the comparison of the amino acid sequence between the human protein of the present invention (HP) and the nematode putative protein F13H11.3 (CE). Therein, the marks of -, *, and . represent a gap, an amino acid residue identical with the protein of the present invention, and an amino acid residue analogous to the protein of the present invention, respectively. The both proteins possessed a homology of 45.1% in the region of 195 amino acid residues at the C-terminal side.

Table 5

```
HS MLALRVARGSWGALRGAAWAPGTRPSKRRACWALLPPVPCCLGCLAERWRLRPAALGLRL

CE                                                          MIVTSMFR
HS PGIGQRNHCSGAGKAAPRPAAGAGAAAEAPGGQWGPASTPSLYENPWTIPNMLSMTRIGL
                                          *..... *. . **** .. .**.
CE GIACRCELQLLLTPRRMLRNFSSLEQKQSPKIESLPPEERGKYKVA-TIPNAICTARIAA
HS APVLGYLITEEDFNIALGVFALAGLTDLLDGFIARNWANQRSALGSALDPLADKILISIL
   .*..***.....*. *. .*..** ********** ..*.* ***.***.***.***..
CE TPLIGYLVVQHNFTPAFVLFTVAGATDLLDGFIARNVPGQKSLLGSVLDPVADKLLISTM
HS YVSLTYADLIPVPLTYMIISRDVMLIAAVFYVRYRTLPTPRTLAKYFNPCYATARLKPTF
   ....***.***.*** ..* **. **.. ** **.....* .*...*** .. .. **.
CE FITMTYAGLIPLPLTSVVILRDICLIGGGFYKRYQVMSPPYSLSRFFNPQVSSMQVVPTM
HS ISKVNTAVQLILVAASLAAPVFNYADSIY--LQILWCFTAFTTAASAYSYYHYGRKTVQV
```

sequences of the present cDNA has revealed the presence of sequences that possessed a homology of 90% or more (for example, Accession No. C16798) in EST, but many sequences were not distinct and the same ORF as that in the present cDNA was not found.

<HP01737> (Sequence Nos. 5, 15, and 29)

Determination of the whole base sequence of the cDNA insert of clone HP01737 obtained from cDNA libraries of human stomach cancer revealed the structure consisting of a 21-bp 5'-nontranslation region, a 1152-bp ORF, and a 132-bp 3'-nontranslation region. The ORF codes for a protein consisting of 383 amino acid residues and there existed two transmembrane domains. Figure 5 depicts the hydrophobicity/hydrophilicity profile, obtained by the Kyte-Doolittle method, of the present protein. In vitro translation resulted in formation of a translation product of 45 kDa that was almost consistent with the molecular weight of 43,222 predicted from the ORF.

The search of the protein data base using the amino acid sequence of the present protein has revealed the presence of sequences that were analogous to the nematode putative protein K09E9.2 (GenBank Accession No. Z79602). Table 6 shows the comparison of the amino acid sequence between the human protein of the present invention (HP) and the nematode putative protein K09E9.2 (CE). Therein, the marks of -, *, and . represent a gap,

the present invention, respectively. The both proteins possessed

the C-terminal side.

Table 6

```
HS MEALGKLKQFDAYPKTLEDFRVKTCGGATVTIVSGLLMLLLFLSELQYYLTTEVHPELYV
   *. * .**.****.*...****** .*. **..... ..**.. * . .*.***  .*.*
CE MSLLWSLKHFDAYRKPMDDFRVKTLSGGLVTLIATIAIVLLIVLETKQFLSTEVLEHLFV
HS D-KSRGDKLKINIDVLFPHMPCAYLSIDAMDVAGEQQLDVEHNLFKQRLDKDGIPVSSEA
   * ........*..*. *...**.....*.***..*.* ........ *** .*  .*..*
CE DSTTSDERVHIEFDITFTKLPCNFITVDVMDVSSEAQENINDDIYRLRLDPEGRNISESA
HS ERHELGKVEVTVFDPDSLDPDRCESCYGAEAEDIKCCNTCEDVREAYRRRGWAFKNPDTI
   .. *... ...* ..* ..  .*.*****.*..* *****.**..**  .**.  * ...
CE QKIEINQNKTSVETTDVIQEVKCGSCYGAAADGI-CCNTCDDVKSAYAVKGWQV-NIEEV
HS EQCRREGFSQKMQEQKNEGCQVYGFLEVNKVAGNFHFAPGKSFQQSHVHVHDLQSFGLDN
   ***... . ....*.*****.*** ..*.*******.***..  *. . *****....  .
CE EQCKNDKWVKEFNEHKNEGCRVYGTVKVAKVAGNFHLAPGDPHQAMRSHVHDLHNLDPVK
HS INMTHYIQHLSFGEDYPGIVNPLDHTNVTAPQASMMFQYFVKVVPTVYMKVDGEVLRTNQ
   .. .* ..*.***...**   *** .  *. ....*.**.****** *  .** * ...*
CE FDASHTVNHVSFGKSFPGKNYPLDGKVNTDNRGGIMYQYYVKVVPTRYDYLDGRVDQSHQ
HS FSVTRHEKVANGLLGDQGLPGVFVLYELSPMMVKLTEKHRSFTHFLTGVCAIIGGMFTVA
   **** *.*  .  . . **** *.  **.**.**.  .* ..**.  **...***.**.*..*
CE FSVTTHKK--DLGFRQSGLPGFFLQYEFSPLMVQYEEFRQSFASFLVSLCAIVGGVFAMA
HS GLIDSLIYHSARAIQKKIDLGKTT
    *.*  ****.* ....*.  ** *
CE QLVDITIYHSSRYMKSRIAGGKLT
```

Furthermore, the search of the GenBank using the base sequences of the present cDNA has revealed the presence of

<HP01962> (Sequence Nos. 6, 16, and 31)

Determination of the whole base sequence of the cDNA insert of clone HP01962 obtained from cDNA libraries of human liver revealed the structure consisting of a 73-bp 5'-nontranslation region, a 600-bp ORF, and a 226-bp 3'-nontranslation region. The ORF codes for a protein consisting of 199 amino acid residues and there existed at least three transmembrane domains. Figure 6 depicts the hydrophobicity/hydrophilicity profile, obtained by the Kyte-Doolittle method, of the present protein. In vitro translation resulted in formation of a translation product of 21 kDa that was almost consistent with the molecular weight of 22,134 predicted from the ORF.

The search of the protein data base using the amino acid sequence of the present protein has revealed the presence of sequences that were analogous to a rat phosphatidylethanolamine N-methyltransferase (SWISS-PROT Accession No. Q08388). Table 7 shows the comparison of the amino acid sequence between the human protein of the present invention (HP) and the rat phosphatidylethanolamine N-methyltransferase (RN). Therein, the marks of -, *, and . represent a gap, an amino acid residue identical with the protein of the present invention, and an amino acid residue analogous to the protein of the present invention, respectively. The both proteins possessed a homology of 44.6% in the entire

Table 7

```
HS MTRLLGYVDPLDPSFVAAVITITFNPLYWNVVARWEHKTRKLSRAFGSPYLACYSLSVTI
   ..******* .*******.**.****.********..******************. .*
RN  SWLLGYVDPTEPSFVAAVLTIVFNPLFWNVVARWEQRTRKLSRAFGSPYLACYSLGSII
HS LLLNFLRSHCFTQAMLSQPRMESLDTPAAYSLGLALLGLGVVLVLSSFFALGFAGTFLGD
   ****.**********.***.**.**... * ******* *.*.*****.****.******
RN LLLNILRSHCFTQAMMSQPKMEGLDSHTIYFLGLALLGWGLVFVLSSFYALGFTGTFLGD
HS YFGILKEARVTVFPFNILDNPMYWGSTANYLGWAIMHASPTGLLLTVLVALTYIVALLYE
   *******.***.***..*****************.***************.*.****.*
RN YFGILKESRVTTFPFSVLDNPMYWGSTANYLGWALMHASPTGLLLTVLVALVYVVALLFE
HS EPFTAEIYRQKASGSHKRS
   *********.**.  ****
RN EPFTAEIYRRKATRLHKRS
```

Furthermore, the search of the GenBank using the base sequences of the present cDNA has revealed the presence of sequences that possessed a homology of 90% or more and contained an initiation codon (for example, Accession No. H83024) in EST, but many sequences were not distinct and the same ORF as that in the present cDNA was not found.

The rat phosphatidylethanolamine N-methyltransferase is a membrane protein which is associated with the biosynthesis of phosphatidylethanolamine [Cui, Z. et al., J. Biol. Chem. 268: 16655-16663 (1993)]. The present protein is considered to be a

it diseases that are associated with abnormalities of this enzyme.

Determination of the whole base sequence of the cDNA insert of clone HP10435 obtained from cDNA libraries of human stomach cancer revealed the structure consisting of an 8-bp 5'-nontranslation region, a 690-bp ORF, and a 207-bp 3'-nontranslation region. The ORF codes for a protein consisting of 229 amino acid residues and there existed one transmembrane domain each at the N-terminus and at the C-terminus. Figure 7 depicts the hydrophobicity/hydrophilicity profile, obtained by the Kyte-Doolittle method, of the present protein. Introduction of an expression vector, wherein the HindIII-BalI fragment containing a cDNA portion coding for the N-terminal 109 amino acid residues of the present protein was inserted into the HindIII-EcoRV site of pSSD3, into the COS7 cells revealed the urokinase activity on the cell surface to indicate that the present protein remains in the membrane. In vitro translation resulted in formation of a translation product of 24 kDa that was almost consistent with the molecular weight of 24,688 predicted from the ORF.

The search of the protein data base using the amino acid sequence of the present protein has not revealed the presence of any known protein having an analogy. Also, the search of the GenBank using the base sequences of the present cDNA has revealed the presence of sequences that possessed a homology of 90% or more

ORF as that in the present cDNA was not found.

Determination of the whole base sequence of the cDNA insert of clone HP10479 obtained from cDNA libraries of the human lymphoma U937 revealed the structure consisting of a 38-bp 5'-nontranslation region, a 537-bp ORF, and a 266-bp 3'-nontranslation region. The ORF codes for a protein consisting of 178 amino acid residues and there existed a signal-like sequence at the N-terminus and one transmembrane domain at the C-terminus. Figure 8 depicts the hydrophobicity/hydrophilicity profile, obtained by the Kyte-Doolittle method, of the present protein. Introduction of an expression vector, wherein the HindIII-BanII (blunt-ended by treatment with T4DNA polymerase) fragment containing a cDNA portion coding for the N-terminal 45 amino acid residues of the present protein was inserted into the HindIII-SmaI site of pSSD3, into the COS7 cells revealed the urokinase activity in the culture medium to indicate that the present protein is the type-I membrane protein. In vitro translation resulted in formation of a translation product of 33 kDa that was larger than the molecular weight of 19,453 predicted from the ORF. Application of the -3,-1 rule, a method for predicting the cleavage site in the secretory signal sequence, allows to expect that the maturation protein starts from glutamine at position 22.

The search of the protein data base using the amino acid sequence of the present protein has revealed the presence of

of the amino acid sequence between the human protein of the present

Therein, the marks of -, *, and . represent a gap, an amino acid residue identical with the protein of the present invention, and an amino acid residue analogous to the protein of the present invention, respectively. The both proteins possessed a homology of 48.1% in the entire region.

Table 8

```
HS MSPSGRLCLLTIVGLILPTRGQTLKDTTSSSSADSTIMDIQVPTRAPDAVYTELQPTSPT
   ** *.********.****.**** *..**  .** *  ...  ...**.. ...*.*. .
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HS PTWPADETPQ--PQTQTQQLEG-TDGPLVTDPETHKSTKAAHPTDDTTTLSERPSPSTDV
    *. .....*  .**.****.  ...  *.**..*.*.* . *  ...  *. ***..
MM WTREEATGSQTAAQTETQQLTKMATSNPVSDPGPHTSSKKGTP---AVSRIEPLSPSKNF
HS QTDPQTLKPSGFHEDDPFFYDEHTLRKRGLLVAAVLFITGIIILTSGKCRQLSRLCRNHC
   . . . .* . .*..**.**.  **********************************..* *.
MM MPPSYIEHPLDSNENNPFYYDDTTLRKRGLLVAAVLFITGIIILTSGKCRQLSQFCLNRH
HS R
   *
MM R
```

Furthermore, the search of the GenBank using the base sequences of the present cDNA has revealed the presence of sequences that possessed a homology of 90 or more (for example, Accession No. AA296696) in EST, but, since they are partial sequences, it can not be judged whether or not any of these

The mouse ion channel homologue KIF is one of proteins which

NIH3T3 fibroblast cells and has been considered to play an important role in the cell cycle and proliferation [Fu, X. et al., Mol. Cell. Biol. 17: 1505-1512 (1997)].

<HP10481> (Sequence Nos. 9, 19, and 37)

Determination of the whole base sequence of the cDNA insert of clone HP10481 obtained from cDNA libraries of the human lymphoma U937 revealed the structure consisting of a 104-bp 5'-nontranslation region, a 1332-bp ORF, and a 15-bp 3'-nontranslation region. The ORF codes for a protein consisting of 443 amino acid residues and there existed one transmembrane domain at the N-terminus. Figure 9 depicts the hydrophobicity/hydrophilicity profile, obtained by the Kyte-Doolittle method, of the present protein. Introduction of an expression vector, wherein the HindIII-PvuII fragment containing a cDNA portion coding for the N-terminal 148 amino acid residues of the present protein was inserted into the HindIII-EcoRV site of pSSD3, into the COS7 cells revealed the urokinase activity on the cell surface to indicate that the present protein is the type-II membrane protein. In vitro translation resulted in formation of a translation product of 51 KDa that was almost consistent with the molecular weight of 51,145 predicted from the ORF.

The search of the protein data base using the amino acid sequence of the present protein has not revealed the presence of

presence of sequences that possessed a homology of 9 or more

sequences was shorter than the present cDNAs and was not found to contain the initiation codon.

<HP10495> (Sequence Nos. 19, 20, and 39)

Determination of the whole base sequence of the cDNA insert of clone HP10495 obtained from cDNA libraries of human stomach cancer revealed the structure consisting of a 62-bp 5'-nontranslation region, a 393-bp ORF, and a 431-bp 3'-nontranslation region. The ORF codes for a protein consisting of 130 amino acid residues and there existed two transmembrane domains. Figure 10 depicts the hydrophobicity/hydrophilicity profile, obtained by the Kyte-Doolittle method, of the present protein. In vitro translation resulted in formation of a translation product of 25 kDa that was larger than the molecular weight of 14,964 predicted from the ORF.

The search of the protein data base using the amino acid sequence of the present protein has not revealed the presence of any known protein having an analogy. Also, the search of the GenBank using the base sequences of the present cDNA has revealed the presence of sequences that possessed a homology of 90% or more (for example, Accession No. AA431001) in EST, but each of them was shorter than the present cDNA and was not found to contain the initiation codon.

Transmembrane domains and cDNAs coding for these proteins as well

of the present invention exist in the cell membrane, so that they are considered to be proteins controlling the proliferation and the differentiation of the cells. Accordingly, the proteins of the present invention can be employed as pharmaceuticals such as carcinostatic agents relating to the control of the proliferation and the differentiation of the cells or as antigens for preparing antibodies against said proteins. The cDNAs of the present invention can be utilized as probes for the gene diagnosis and gene sources for the gene therapy. Furthermore, the cDNAs can be utilized for large-scale expression of said proteins. Cells, wherein these membrane protein genes are introduced and membrane proteins are expressed in large amounts, can be utilized for detection of the corresponding ligands, screening of novel low-molecular pharmaceuticals, and so on.

The present invention also provides genes corresponding to the polynucleotide sequences disclosed herein. "Corresponding genes" are the regions of the genome that are transcribed to produce the mRNAs from which cDNA polynucleotide sequences are derived and may include contiguous regions of the genome necessary for the regulated expression of such genes. Corresponding genes may therefore include but are not limited to coding sequences, 5' and 3' untranslated regions, alternatively spliced exons, introns, promoters, enhancers, and silencer or

disclosed herein. Such methods include the preparation of probes

identification and/or amplification of genes in appropriate genomic libraries or other sources of genomic materials. An "isolated gene" is a gene that has been separated from the adjacent coding sequences, if any, present in the genome of the organism from which the gene was isolated.

Organisms that have enhanced, reduced, or modified expression of the gene(s) corresponding to the polynucleotide sequences disclosed herein are provided. The desired change in gene expression can be achieved through the use of antisense polynucleotides or ribozymes that bind and/or cleave the mRNA transcribed from the gene (Albert and Morris, 1994, Trends Pharmacol. Sci. 15(7): 250-254; Lavarosky et al., 1997, Biochem. Mol. Med. 62(1): 11-22; and Hampel, 1998, Prog. Nucleic Acid Res. Mol. Biol. 58: 1-39; all of which are incorporated by reference herein). Transgenic animals that have multiple copies of the gene(s) corresponding to the polynucleotide sequences disclosed herein, preferably produced by transformation of cells with genetic constructs that are stably maintained within the transformed cells and their progeny, are provided. Transgenic animals that have modified genetic control regions that increase or reduce gene expression levels, or that change temporal or spatial patterns of gene expression, are also provided (see European Patent No. 0 649 464 B1, incorporated by reference herein).

have been partially or completely inactivated, through insertion

deletion of all or part of the corresponding gene(s). Partial or complete gene inactivation can be accomplished through insertion, preferably followed by imprecise excision, of transposable elements (Plasterk, 1992, Bioessays 14(9): 629-633; Zwaal et al., 1993, Proc. Natl. Acad. Sci. USA 90(16): 7431-7435; Clark et al., 1994, Proc. Natl. Acad. Sci. USA 91(2): 719-722; all of which are incorporated by reference herein), or through homologous recombination, preferably detected by positive/negative genetic selection strategies (Mansour et al., 1988, Nature 336: 348-352; U.S. Patent Nos. 5,464,764; 5,487,992; 5,627,059; 5,631,153; 5,614, 396; 5,616,491; and 5,679,523; all of which are incorporated by reference herein). These organisms with altered gene expression are preferably eukaryotes and more preferably are mammals. Such organisms are useful for the development of non-human models for the study of disorders involving the corresponding gene(s), and for the development of assay systems for the identification of molecules that interact with the protein product(s) of the corresponding gene(s).

Where the protein of the present invention is membrane-bound (e.g., is a receptor), the present invention also provides for soluble forms of such protein. In such forms part or all of the intracellular and transmembrane domains of the protein are deleted such that the protein is fully secreted from

identified in accordance with known techniques for determination

Proteins and protein fragments of the present invention include proteins with amino acid sequence lengths that are at least 25% (more preferably at least 50%, and most preferably at least 75%) of the length of a disclosed protein and have at least 60% sequence identity (more preferably, at least 75% identity; most preferably at least 90% or 95% identity) with that disclosed protein, where sequence identity is determined by comparing the amino acid sequences of the proteins when aligned so as to maximize overlap and identity while minimizing sequence gaps. Also included in the present invention are proteins and protein fragments that contain a segment preferably comprising 8 or more (more preferably 20 or more, most preferably 30 or more) contiguous amino acids that shares at least 75% sequence identity (more preferably, at least 85% identity; most preferably at least 95% identity) with any such segment of any of the disclosed proteins.

Species homologs of the disclosed polynucleotides and proteins are also provided by the present invention. As used herein, a "species homologue" is a protein or polynucleotide with a different species of origin from that of a given protein or polynucleotide, but with significant sequence similarity to the given protein or polynucleotide, as determined by those of skill in the art. Species homologs may be isolated and identified by making suitable probes or primers from the sequences provided

The invention also encompasses allelic variants of the

occurring alternative forms of the isolated polynucleotide which also encode proteins which are identical, homologous, or related to that encoded by the polynucleotides.

The invention also includes polynucleotides with sequences complementary to those of the polynucleotides disclosed herein.

The present invention also includes polynucleotides capable of hybridizing under reduced stringency conditions, more preferably stringent conditions, and most preferably highly stringent conditions, to polynucleotides described herein. Examples of stringency conditions are shown in the table below: highly stringent conditions are those that are at least as stringent as, for example, conditions A-F; stringent conditions are at least as stringent as, for example, conditions G-L; and reduced stringency conditions are at least as stringent as, for example, conditions M-R.

Table 9

Stringency Condition	Polynucleotide Hybrid	Hybrid Length (bp)‡	Hybridization Temperature and Buffer†	Wash Temperature and Buffer†
A	DNA : DNA	≥50	65℃; 1×SSC -or- 42℃; 1×SSC,50% formamide	65℃; 0.3×SSC
B	DNA : DNA	<50	T_B*; 1×SSC	T_B*; 1×SSC
C	DNA : RNA	≥50	67℃; 1×SSC -or- 45℃; 1×SSC,50% formamide	67℃; 0.3×SSC
D	DNA : RNA	<50	T_D*; 1×SSC	T_D*; 1×SSC
E	RNA : RNA	≥50	70℃; 1×SSC -or- 50℃; 1×SSC,50% formamide	70℃; 0.3×SSC
F	RNA : RNA	<50	T_F*; 1×SSC	T_F*; 1×SSC
G	DNA : DNA	≥50	65℃; 4×SSC -or- 42℃; 4×SSC,50% formamide	65℃; 1×SSC
H	DNA : DNA	<50	T_H*; 4×SSC	T_H*; 4×SSC
I	DNA : RNA	≥50	67℃; 4×SSC -or- 45℃; 4×SSC,50% formamide	67℃; 1×SSC
J	DNA : RNA	<50	T_J*; 4×SSC	T_J*; 4×SSC
K	RNA : RNA	≥50	70℃; 4×SSC -or- 50℃; 4×SSC,50% formamide	67℃; 1×SSC
L	RNA : RNA	<50	T_L*; 2×SSC	T_L*; 2×SSC
M	DNA : DNA	≥50	50℃; 4×SSC -or- 40℃; 6×SSC,50% formamide	50℃; 2×SSC
N	DNA : DNA	<50	T_N*; 6×SSC	T_N*; 6×SSC
O	DNA : RNA	≥50	55℃; 4×SSC -or- 42℃; 6×SSC,50% formamide	55℃; 2×SSC
P	DNA : RNA	<50	T_P*; 6×SSC	T_P*; 6×SSC
Q	RNA : RNA	≥50	60℃; 4×SSC -or- 45℃; 6×SSC,50% formamide	60℃; 2×SSC
R	RNA : RNA	<50	T_R*; 4×SSC	T_R*; 4×SSC

‡: The hybrid length is that anticipated for the hybridized region(s) of the hybridizing polynucleotides. When hybridizing a polynucleotide to a target polynucleotide of unknown sequence, the hybrid length is assumed to be that of the hybridizing polynucleotide. When polynucleotides of known sequence are hybridized, the hybrid length can be determined by aligning the sequences of the polynucleotides and identifying the region or regions of optimal sequence complementarity.

†: SSPE (1×SSPE is 0.15M NaCl, 10mM NaH_2PO_4, and 1.25mM EDTA, pH7.4) can be substituted for SSC (1×SSC is 0.15M NaCl and 15mM sodium citrate) in the hybridization and wash buffers; washes are performed for 15 minutes after hybridization is complete.

*: T_B - T_R: The hybridization temperature for hybrids anticipated to be less than 50 base pairs in length should be 5-10℃ below the melting temperature (T_m) of the hybrid, where T_m is determined according to the following equations. For hybrids less than 18 base pairs in length, T_m(℃)=2(# of A + T bases) + 4(# of G + C bases). For hybrids between 18 and 49 base pairs in length, T_m(℃)=81.5 + 16.6($\log_{10}$[Na^+]) + 0.41 (%G+C) - (600/N), where N is the number of bases in the hybrid, and [Na^+] is the concentration of sodium ions in the hybridization buffer ([Na^+] for 1×SSC = 0.165M).

Additional examples of stringency conditions for polynucleotide hybridization are provided in Sambrook, J., E.F. Fritsch, and T. Maniatis, 1989, Molecular Cloning: A Laboratory Manual, Cold Spring Harbor Laboratory Press, Cold Spring Harbor, NY, chapters 9 and 11, and Current Protocols in Molecular Biology, 1995, F.M. Ausubel et al., eds., John Wiley & Sons, Inc., sections 2.10 and 6.3-6.4, incorporated herein by reference.

Preferably, each such hybridizing polynucleotide has a length that is at least 25% (more preferably at least 50%, and most preferably at least 75%) of the length of the polynucleotide of the present invention to which it hybridizes, and has at least 60% sequence identity (more preferably, at least 75% identity; most preferably at least 90% or 95% identity) with the polynucleotide of the present invention to which it hybridizes, where sequence identity is determined by comparing the sequences of the hybridizing polynucleotides when aligned so as to maximize overlap and identity while minimizing sequence gaps.

CLAIMS

1. A protein comprising any of the amino acid sequences represented by Sequence Nos. 1 to 10.

2. A DNA coding for the protein according to Claim 1.

3. A cDNA comprising any of the base sequences represented by Sequence Nos. 11 to 20.

4. The cDNA according to Claim 3 comprising any of the base sequences represented by Sequence Nos. 21, 23, 25, 27, 29, 31, 33, 35, 37 and 39.

5. A vector capable of expressing the DNA or cDNA according to any of Claims 2 to 4 in in vitro translation or an eucaryotic cell.

6. A transformation eucaryotic cell capable of expressing the DNA or cDNA according to any of Claim 2 to 4 to produce the protein according to Claim 1.

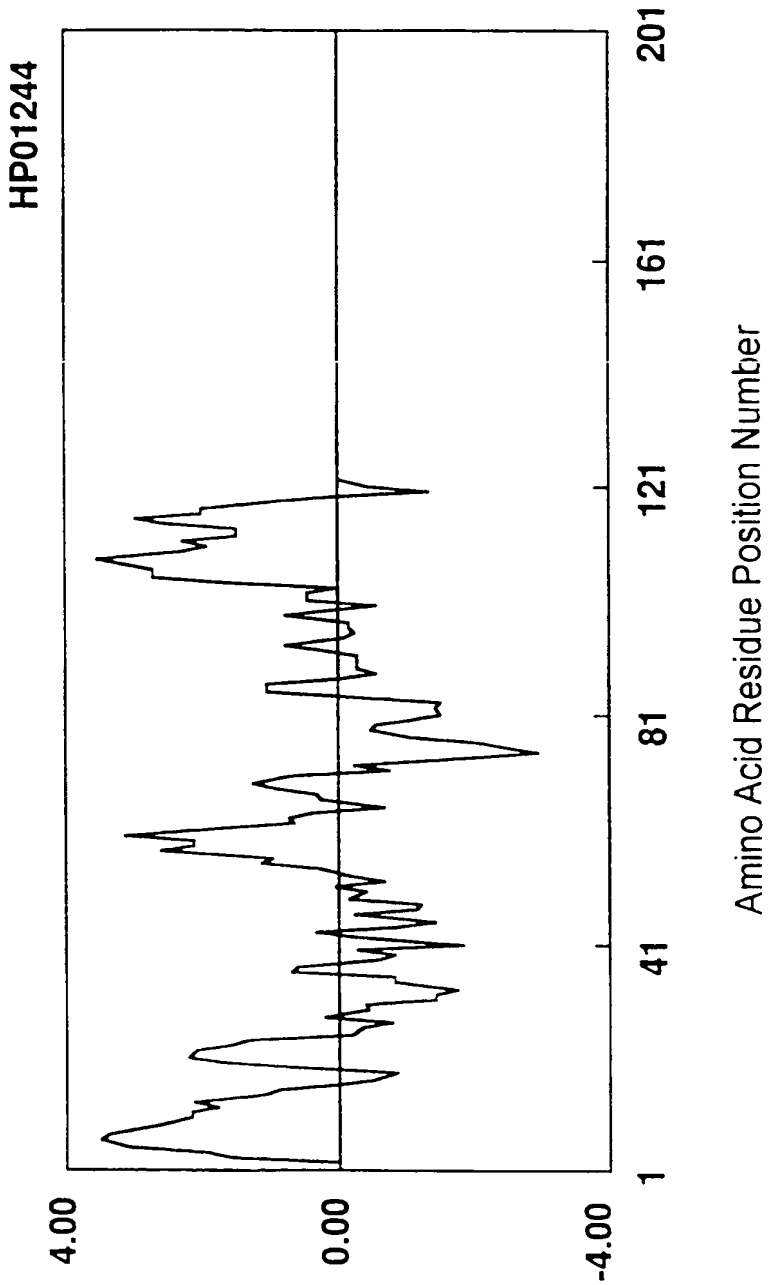
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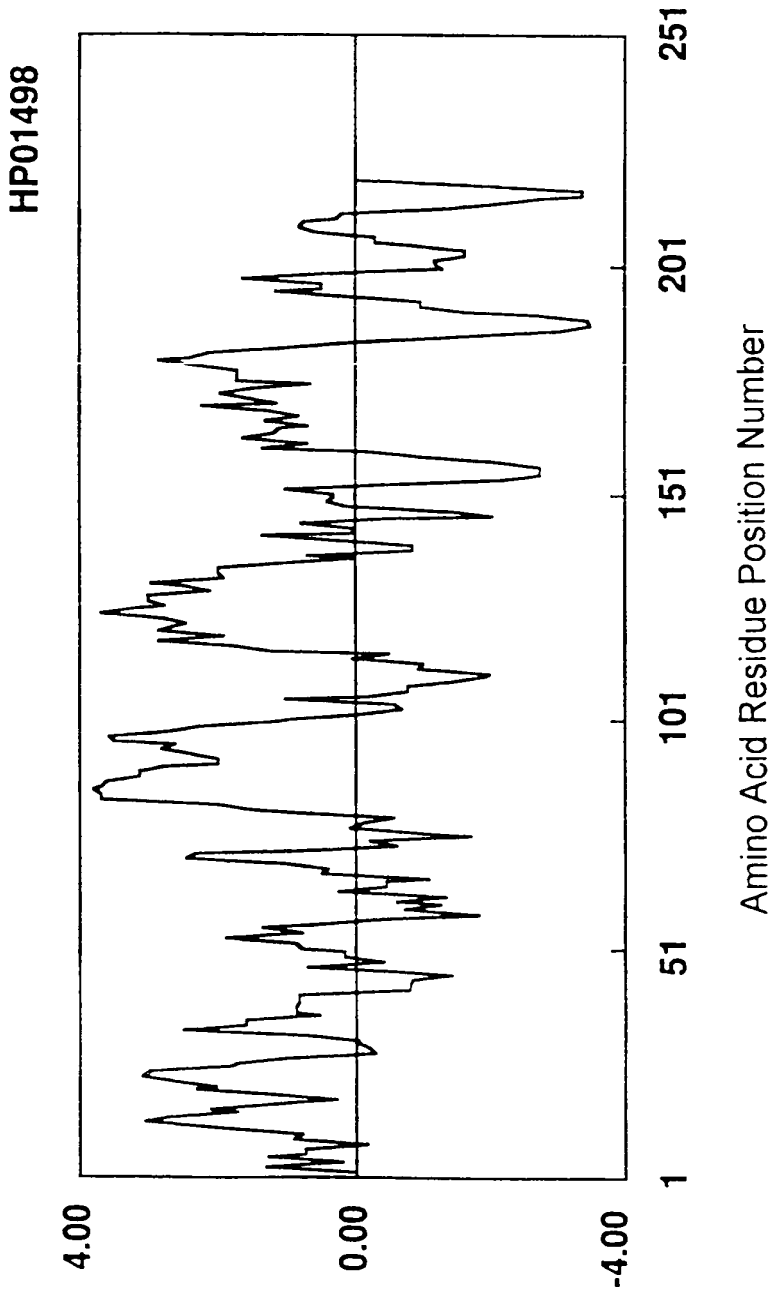
Fig. 1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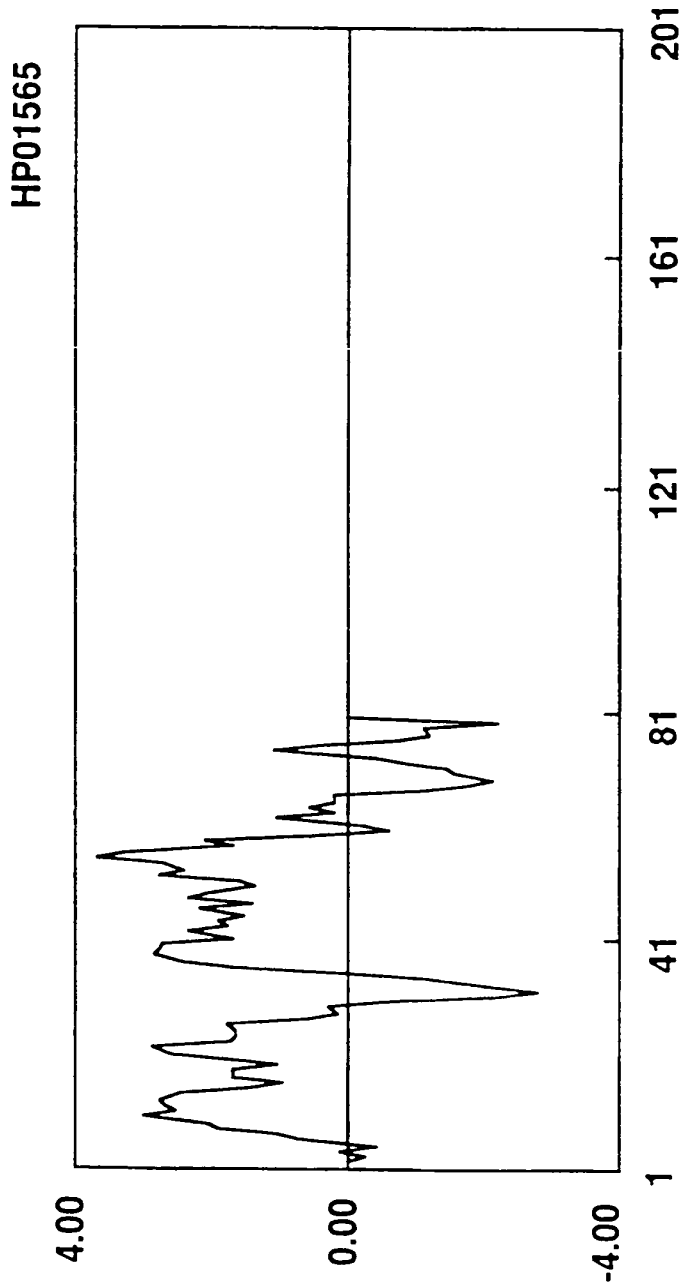
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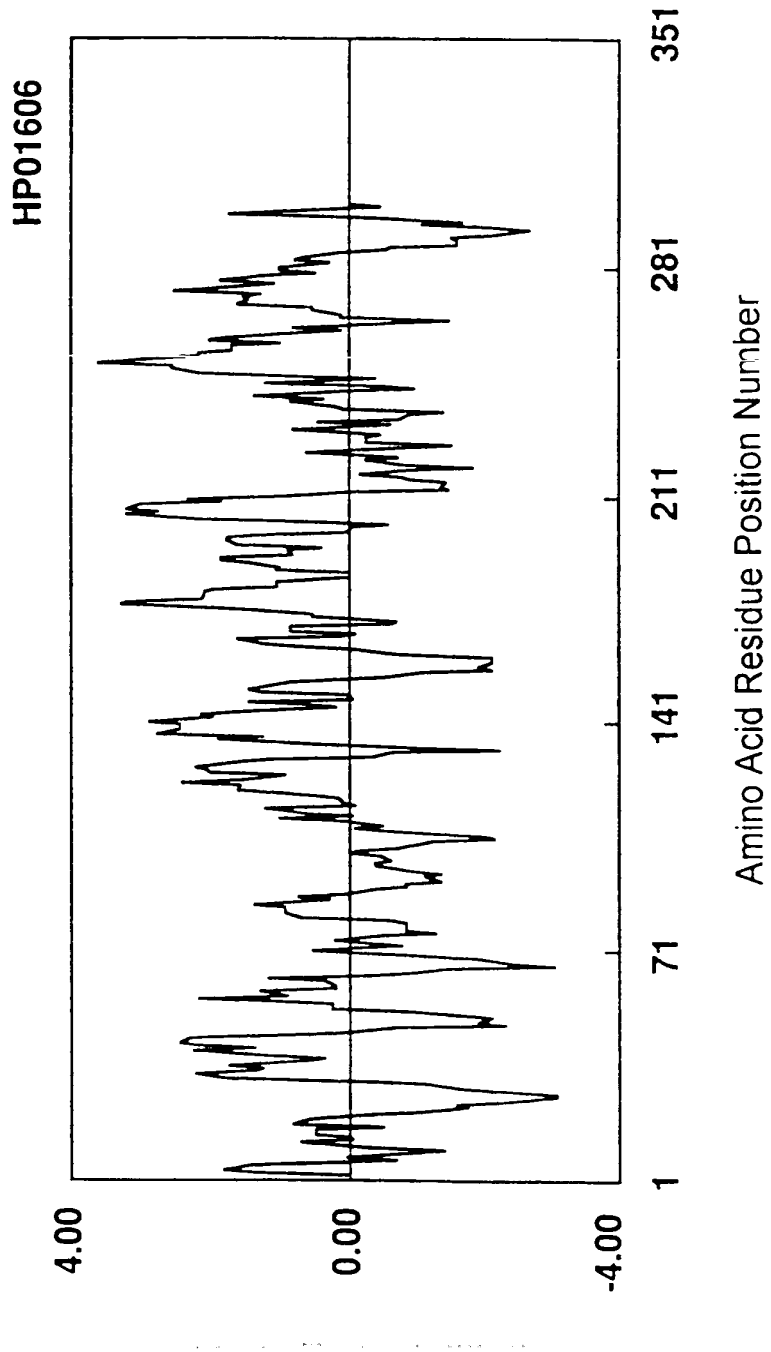
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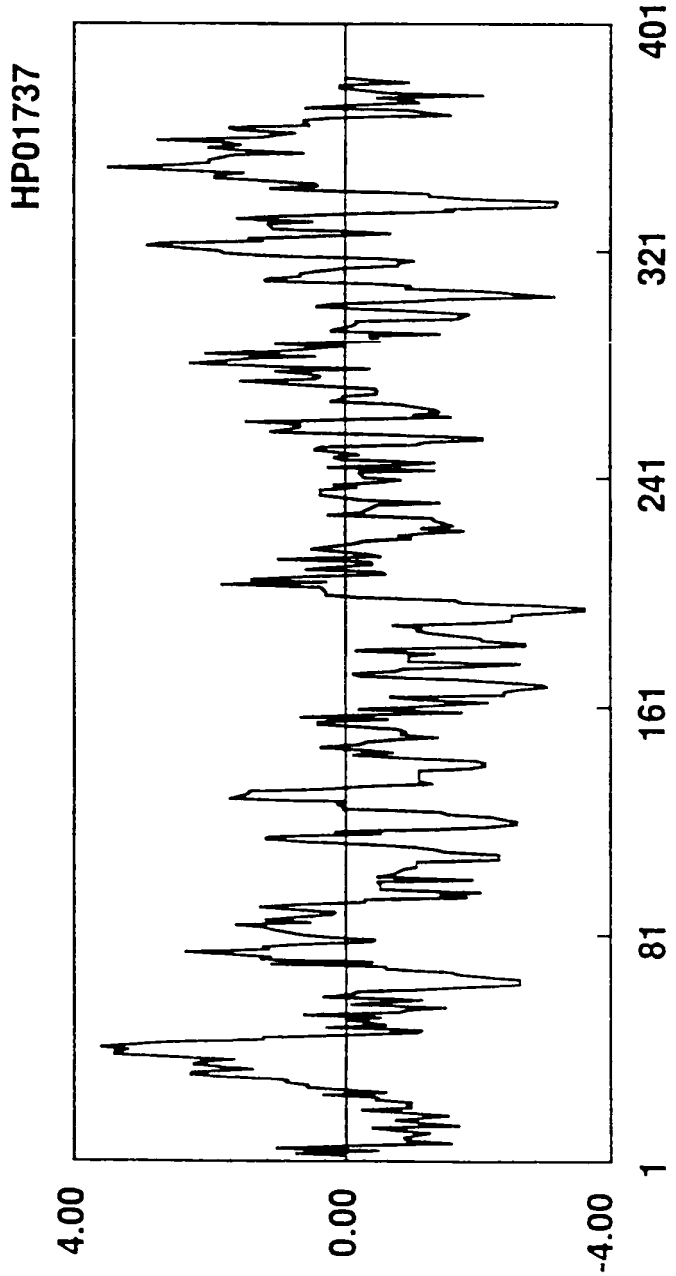
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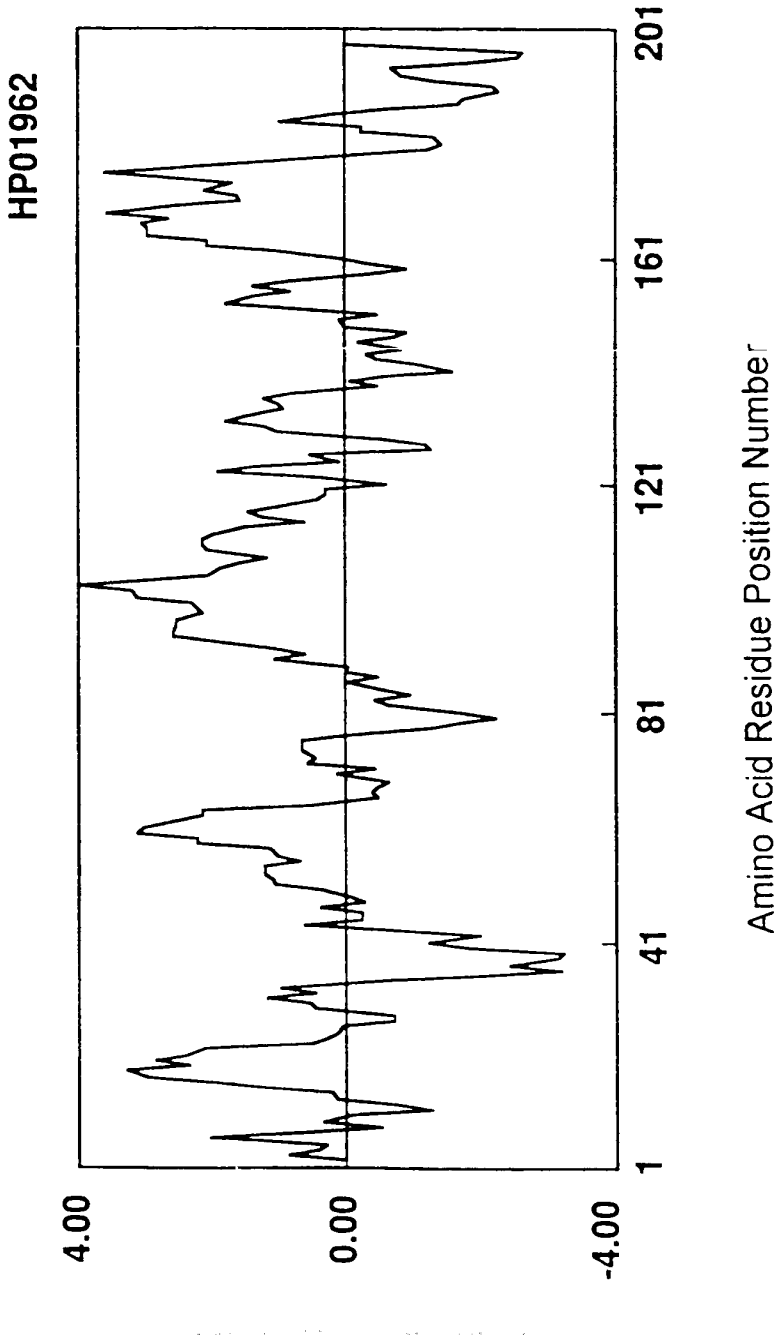
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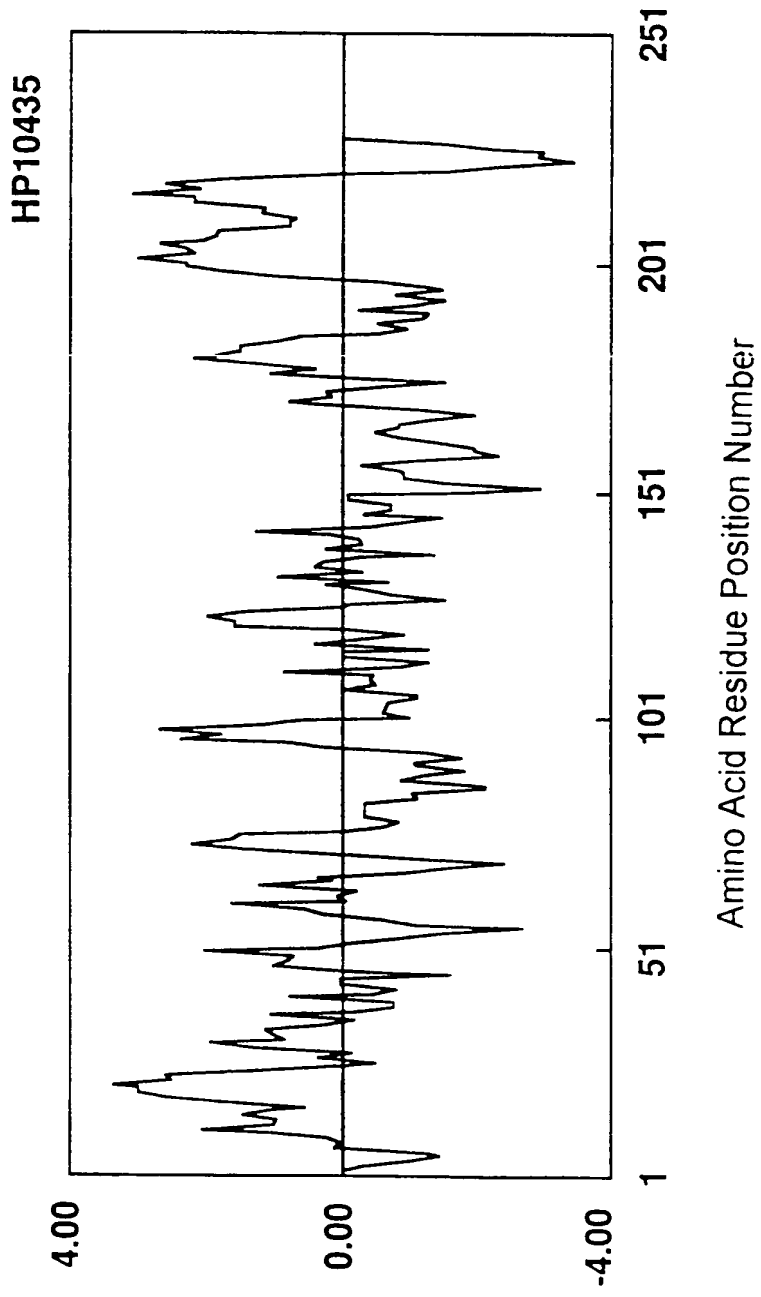
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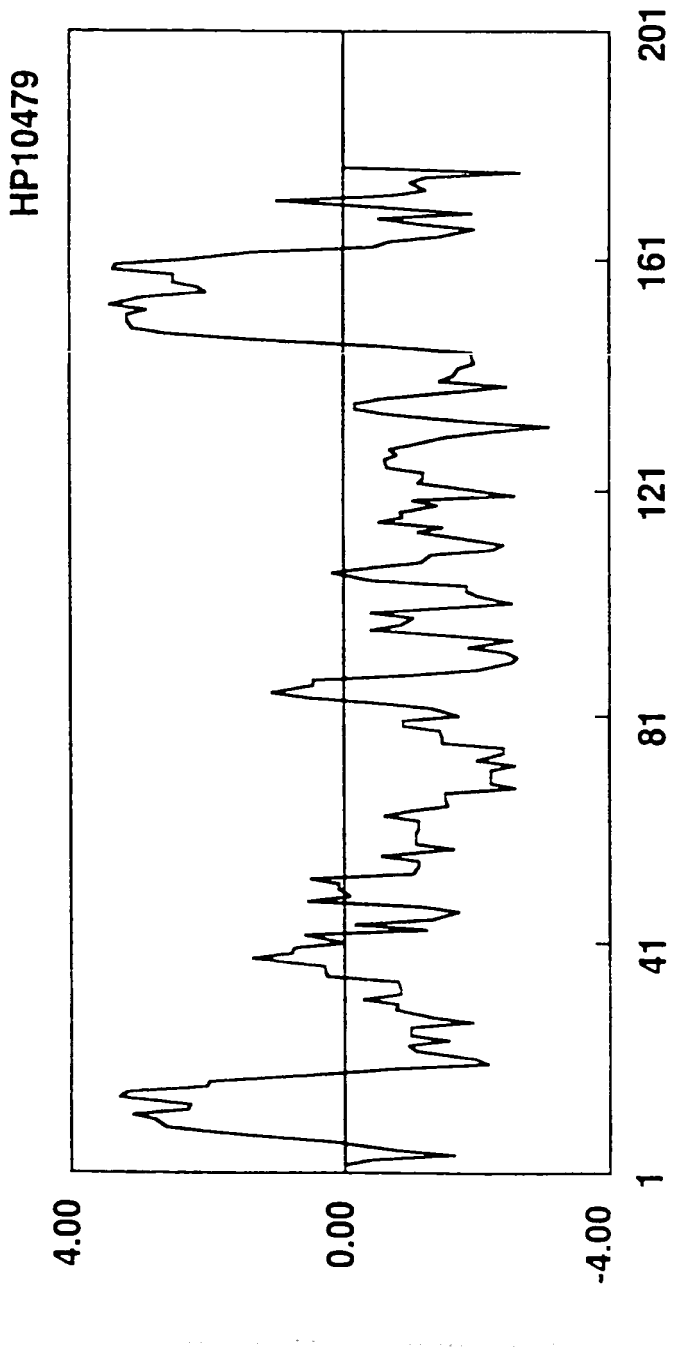
Fig. 7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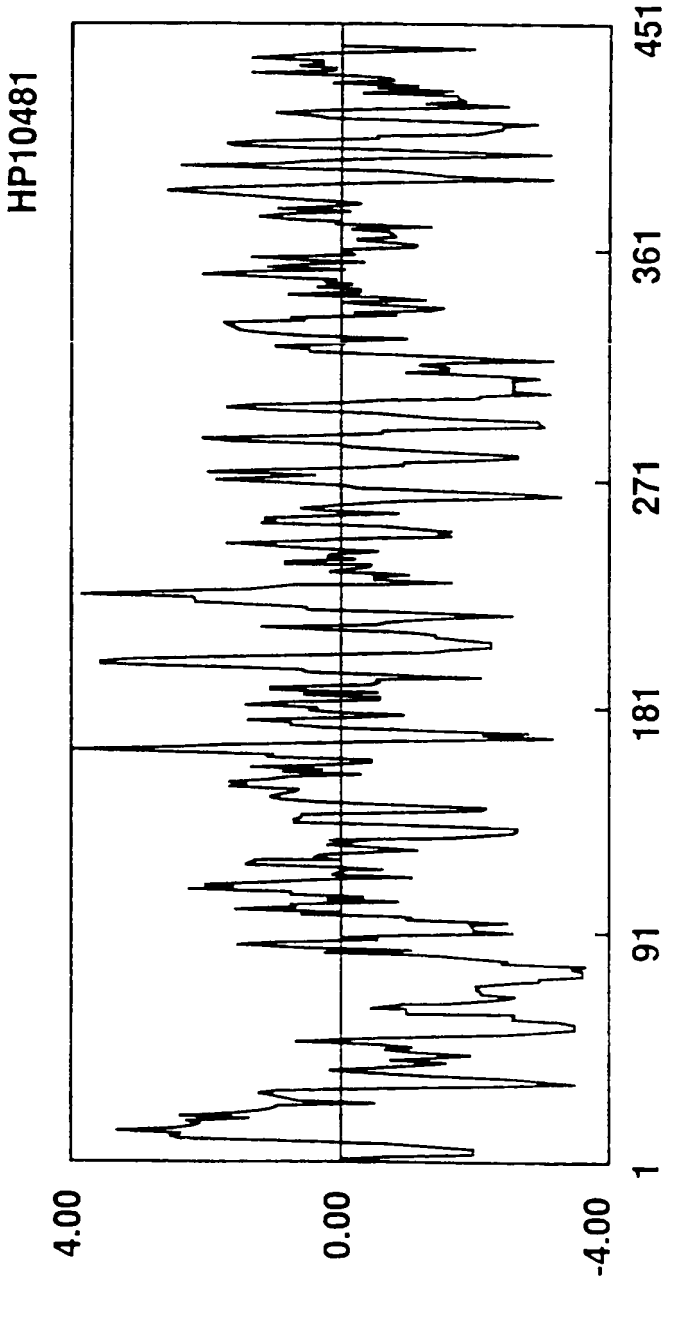
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Fig. 9

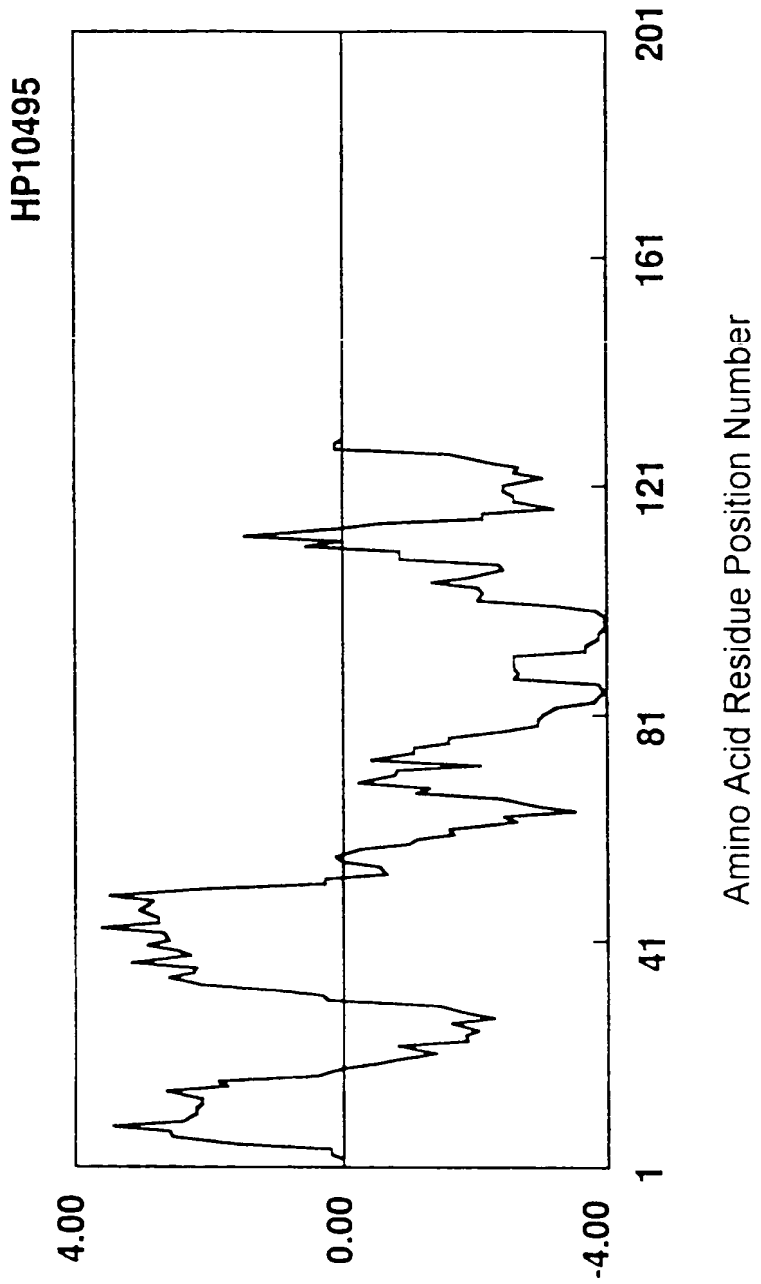
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Fig. 10

Sequence Listing

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50 55 60

Val Tyr Asp Ser Leu Leu Ala Leu Pro Gln Asp Leu Gln Ala Ala Arg

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115 120 125

Leu Leu Thr Leu Val Pro Val Ser Trp Ser Ala Asn Thr Ile Ile Arg

130 135 140

Asp Phe Tyr Asn Pro Val Val Pro Glu Ala Gln Lys Arg Glu Met Gly

145 150 155 160

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Gly Ala Leu Leu Cys Cys Ser Cys Pro Pro Arg Glu Lys Lys Tyr Thr

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212 PRT

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Trp Arg Leu Arg Pro Ala Ala Leu Gly Leu Arg Leu Pro Gly Ile Gly
50 55 60
Gln Arg Asn His Cys Ser Gly Ala Gly Lys Ala Ala Pro Arg Pro Ala
65 70 75 80
Ala Gly Ala Gly Ala Ala Ala Glu Ala Pro Gly Gly Gln Trp Gly Pro
85 90 95
Ala Ser Thr Pro Ser Leu Tyr Glu Asn Pro Trp Thr Ile Pro Asn Met
100 105 110
Leu Ser Met Thr Arg Ile Gly Leu Ala Pro Val Leu Gly Tyr Leu Ile
115 120 125
Ile Glu Glu Asp Phe Asn Ile Ala Leu Gly Val Phe Ala Leu Ala Gly
130 135 140
Leu Thr Asp Leu Leu Asp Gly Phe Ile Ala Arg Asn Trp Ala Asn Gln
145 150 155 160
Arg Ser Ala Leu Gly Ser Ala Leu Asp Pro Leu Ala Asp Lys Ile Leu
165 170 175
Ile Ser Ile Leu Tyr Val Ser Leu Thr Tyr Ala Asp Leu Ile Pro Val
180 185 190
Pro Leu Thr Tyr Met Ile Ile Ser Arg Asp Val Met Leu Ile Ala Ala
195 200 205
Val Phe Tyr Val Arg Tyr Arg Thr Leu Pro Thr Pro Arg Thr Leu Ala
210 215 220
Lys Tyr Phe Asn Pro Cys Tyr Ala Thr Ala Arg Leu Lys Pro Thr Phe
245 250 255

260 265 270

Leu Trp Cys Phe Thr Ala Phe Thr Thr Ala Ala Ser Ala Tyr Ser Tyr

275 280 285

Tyr His Tyr Gly Arg Lys Thr Val Gln Val Ile Lys Asp

290 295 300

〈210〉 5

〈211〉 383

〈212〉 PRT

〈213〉 Homo sapiens

〈400〉 5

Met Glu Ala Leu Gly Lys Leu Lys Gln Phe Asp Ala Tyr Pro Lys Thr

1 5 10 15

Leu Glu Asp Phe Arg Val Lys Thr Cys Gly Gly Ala Thr Val Thr Ile

20 25 30

Val Ser Gly Leu Leu Met Leu Leu Leu Phe Leu Ser Glu Leu Gln Tyr

35 40 45

Tyr Leu Thr Thr Glu Val His Pro Glu Leu Tyr Val Asp Lys Ser Arg

50 55 60

Gly Asp Lys Leu Lys Ile Asn Ile Asp Val Leu Phe Pro His Met Pro

65 70 75 80

Leu Asp Val Glu His Asn Leu Phe Lys Gln Arg Leu Asp Lys Asp Gly

Ile Pro Val Ser Ser Glu Ala Glu Arg His Glu Leu Gly Lys Val Glu
115 120 125
Val Thr Val Phe Asp Pro Asp Ser Leu Asp Pro Asp Arg Cys Glu Ser
130 135 140
Cys Tyr Gly Ala Glu Ala Glu Asp Ile Lys Cys Cys Asn Thr Cys Glu
145 150 155 160
Asp Val Arg Glu Ala Tyr Arg Arg Arg Gly Trp Ala Phe Lys Asn Pro
165 170 175
Asp Thr Ile Glu Gln Cys Arg Arg Glu Gly Phe Ser Gln Lys Met Gln
180 185 190
Glu Gln Lys Asn Glu Gly Cys Gln Val Tyr Gly Phe Leu Glu Val Asn
195 200 205
Lys Val Ala Gly Asn Phe His Phe Ala Pro Gly Lys Ser Phe Gln Gln
210 215 220
Ser His Val His Val His Asp Leu Gln Ser Phe Gly Leu Asp Asn Ile
225 230 235 240
Asn Met Thr His Tyr Ile Gln His Leu Ser Phe Gly Glu Asp Tyr Pro
245 250 255
Gly Ile Val Asn Pro Leu Asp His Thr Asn Val Thr Ala Pro Gln Ala
260 265 270
Ser Met Met Phe Gln Tyr Phe Val Lys Val Val Pro Thr Val Tyr Met
275 280 285
Lys Val Asp Gly Glu Val Leu Arg Thr Asn Gln Phe Ser Val Thr Arg
290 295 300
305 310 315 320

325 330 335

Lys His Arg Ser Phe Thr His Phe Leu Thr Gly Val Cys Ala Ile Ile

340 345 350

Gly Gly Met Phe Thr Val Ala Gly Leu Ile Asp Ser Leu Ile Tyr His

355 360 365

Ser Ala Arg Ala Ile Gln Lys Lys Ile Asp Leu Gly Lys Thr Thr

370 375 380

<210> 6

<211> 199

<212> PRT

<213> Homo sapiens

<400> 6

Met Thr Arg Leu Leu Gly Tyr Val Asp Pro Leu Asp Pro Ser Phe Val

1 5 10 15

Ala Ala Val Ile Thr Ile Thr Phe Asn Pro Leu Tyr Trp Asn Val Val

20 25 30

Ala Arg Trp Glu His Lys Thr Arg Lys Leu Ser Arg Ala Phe Gly Ser

35 40 45

Pro Tyr Leu Ala Cys Tyr Ser Leu Ser Val Thr Ile Leu Leu Leu Asn

50 55 60

Met Glu Ser Leu Asp Thr Pro Ala Ala Tyr Ser Leu Gly Leu Ala Leu

Leu Gly Leu Gly Val Val Leu Val Leu Ser Ser Phe Phe Ala Leu Gly
100 105 110
Phe Ala Gly Thr Phe Leu Gly Asp Tyr Phe Gly Ile Leu Lys Glu Ala
115 120 125
Arg Val Thr Val Phe Pro Phe Asn Ile Leu Asp Asn Pro Met Tyr Trp
130 135 140
Gly Ser Thr Ala Asn Tyr Leu Gly Trp Ala Ile Met His Ala Ser Pro
145 150 155 160
Thr Gly Leu Leu Leu Thr Val Leu Val Ala Leu Thr Tyr Ile Val Ala
165 170 175
Leu Leu Tyr Glu Glu Pro Phe Thr Ala Glu Ile Tyr Arg Gln Lys Ala
180 185 190
Ser Gly Ser His Lys Arg Ser
195

<210> 7
<211> 229
<212> PRT
<213> Homo sapiens

<400> 7
Met Ala Pro His Gly Pro Gly Ser Leu Thr Thr Leu Val Pro Trp Ala

20 25 30

35 40 45

Ala Phe Tyr Cys Lys Thr Thr Arg Glu Leu Met Leu His Ala Arg Cys

50 55 60

Cys Leu Asn Gln Lys Gly Thr Ile Leu Gly Leu Asp Leu Gln Asn Cys

65 70 75 80

Ser Leu Glu Asp Pro Gly Pro Asn Phe His Gln Ala His Thr Thr Val

85 90 95

Ile Ile Asp Leu Gln Ala Asn Pro Leu Lys Gly Asp Leu Ala Asn Thr

100 105 110

Phe Arg Gly Phe Thr Gln Leu Gln Thr Leu Ile Leu Pro Gln His Val

115 120 125

Asn Cys Pro Gly Gly Ile Asn Ala Trp Asn Thr Ile Thr Ser Tyr Ile

130 135 140

Asp Asn Gln Ile Cys Gln Gly Gln Lys Asn Leu Cys Asn Asn Thr Gly

145 150 155 160

Asp Pro Glu Met Cys Pro Glu Asn Gly Ser Cys Val Pro Asp Gly Pro

165 170 175

Gly Leu Leu Gln Cys Val Cys Ala Asp Gly Phe His Gly Tyr Lys Cys

180 185 190

Met Arg Gln Gly Ser Phe Ser Leu Leu Met Phe Phe Gly Ile Leu Gly

195 200 205

Ala Thr Thr Leu Ser Val Ser Ile Leu Leu Trp Ala Thr Gln Arg Arg

210 215 220

<210> 8

<211> 178

<212> PRT

<213> Homo sapiens

<400> 8

Met Ser Pro Ser Gly Arg Leu Cys Leu Leu Thr Ile Val Gly Leu Ile
1 5 10 15

Leu Pro Thr Arg Gly Gln Thr Leu Lys Asp Thr Thr Ser Ser Ser Ser
20 25 30

Ala Asp Ser Thr Ile Met Asp Ile Gln Val Pro Thr Arg Ala Pro Asp
35 40 45

Ala Val Tyr Thr Glu Leu Gln Pro Thr Ser Pro Thr Pro Thr Trp Pro
50 55 60

Ala Asp Glu Thr Pro Gln Pro Gln Thr Gln Thr Gln Gln Leu Glu Gly
65 70 75 80

Thr Asp Gly Pro Leu Val Thr Asp Pro Glu Thr His Lys Ser Thr Lys
85 90 95

Ala Ala His Pro Thr Asp Asp Thr Thr Thr Leu Ser Glu Arg Pro Ser
100 105 110

Pro Ser Thr Asp Val Gln Thr Asp Pro Gln Thr Leu Lys Pro Ser Gly
115 120 125

Phe His Glu Asp Asp Pro Phe Phe Tyr Asp Glu His Thr Leu Arg Lys
145 150 155 160

165 170 175

Cys Arg

<210> 9

<211> 443

<212> PRT

<213> Homo sapiens

<400> 9

Met Arg Leu Thr Arg Lys Arg Leu Cys Ser Phe Leu Ile Ala Leu Tyr
1 5 10 15

Cys Leu Phe Ser Leu Tyr Ala Ala Tyr His Val Phe Phe Gly Arg Arg
20 25 30

Arg Gln Ala Pro Ala Gly Ser Pro Arg Gly Leu Arg Lys Gly Ala Ala
35 40 45

Pro Ala Arg Glu Arg Arg Gly Arg Glu Gln Ser Thr Leu Glu Ser Glu
50 55 60

Glu Trp Asn Pro Trp Glu Gly Asp Glu Lys Asn Glu Gln Gln His Arg
65 70 75 80

Phe Lys Thr Ser Leu Gln Ile Leu Asp Lys Ser Thr Lys Gly Lys Thr
85 90 95

Asp Leu Ser Val Gln Ile Trp Gly Lys Ala Ala Ile Gly Leu Tyr Leu
100 105 110

115 120 125

130 135 140

Ile Thr Gly Pro Ala Val Ile Pro Gly Tyr Phe Ser Val Asp Val Asn

145 150 155 160

Asn Val Val Leu Ile Leu Asn Gly Arg Glu Lys Ala Lys Ile Phe Tyr

165 170 175

Ala Thr Gln Trp Leu Leu Tyr Ala Gln Asn Leu Val Gln Ile Gln Lys

180 185 190

Leu Gln His Leu Ala Val Val Leu Leu Gly Asn Glu His Cys Asp Asn

195 200 205

Glu Trp Ile Asn Pro Phe Leu Lys Arg Asn Gly Gly Phe Val Glu Leu

210 215 220

Leu Phe Ile Ile Tyr Asp Ser Pro Trp Ile Asn Asp Val Asp Val Phe

225 230 235 240

Gln Trp Pro Leu Gly Val Ala Thr Tyr Arg Asn Phe Pro Val Val Glu

245 250 255

Ala Ser Trp Ser Met Leu His Asp Glu Arg Pro Tyr Leu Cys Asn Phe

260 265 270

Leu Gly Thr Ile Tyr Glu Asn Ser Ser Arg Gln Ala Leu Met Asn Ile

275 280 285

Leu Lys Lys Asp Gly Asn Asp Lys Leu Cys Trp Val Ser Ala Arg Glu

290 295 300

His Trp Gln Pro Gln Glu Thr Asn Glu Ser Leu Lys Asn Tyr Gln Asp

305 310 315 320

Glu Cys Tyr Arg Ile Tyr Glu Ala Cys Ser Tyr Gly Ser Ile Pro Val

Val Glu Asp Val Met Thr Ala Gly Asn Cys Gly Asn Thr Ser Val His
355 360 365

His Gly Ala Pro Leu Gln Leu Leu Lys Ser Met Gly Ala Pro Phe Ile
370 375 380

Phe Ile Lys Asn Trp Lys Glu Leu Pro Ala Val Leu Glu Lys Glu Lys
385 390 395 400

Thr Ile Ile Leu Gln Glu Lys Ile Glu Arg Arg Lys Met Leu Leu Gln
405 410 415

Trp Tyr Gln His Phe Lys Thr Glu Leu Lys Met Lys Phe Thr Asn Ile
420 425 430

Leu Glu Ser Ser Phe Leu Met Asn Asn Lys Ser
435 440

<210> 10
<211> 130
<212> PRT
<213> Homo sapiens

<400> 10

Met Glu Thr Leu Gly Ala Leu Leu Val Leu Glu Phe Leu Leu Leu Ser
1 5 10 15

Pro Val Glu Ala Gln Gln Ala Thr Glu His Arg Leu Lys Pro Trp Leu
35 40 45

50 55 60

Glu Glu Thr Thr Phe Arg Met Glu Ser Asn Leu Tyr Gln Asp Gln Ser

65 70 75 80

Glu Asp Lys Arg Glu Lys Lys Glu Ala Lys Glu Lys Glu Glu Lys Arg

85 90 95

Lys Lys Glu Lys Lys Thr Ala Lys Glu Gly Glu Ser Asn Leu Gly Leu

100 105 110

Asp Leu Glu Glu Lys Glu Pro Gly Asp His Glu Arg Ala Lys Ser Thr

115 120 125

Val Met

130

<210> 11

<211> 369

<212> DNA

<213> Homo sapiens

<400> 11

atgaaggctg tgctgcttgc cctgttgatg gcaggcttgg ccctgcagcc aggcactgcc 60

ctgctgtgct actcctgcaa agcccaggtg agcaacgagg actgcctgca ggtgaagaac 120

tgcacccagc tgggggagca gtgctggacc gcgcgcatcc gcgccagttg gaccctgacc 180

gtcatcagca aaggctgcag cttgaactgc gtggatgact cacaggacta ctacgtgggc 240

ggcccagcta 369

<210> 12

<211> 660

<212> DNA

<213> Homo sapiens

<400> 12

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atcgtgtgct gcgcgttgcc catgtggcgc gtgtcggcct tcatcggcag caacatcatc 120

acgtcgcaga acatctggga gggcctgtgg atgaactgcg tggtgcagag caccggccag 180

atgcagtgca aggtgtacga ctcgctgctg gcactgccac aggacttca ggcggccccc 240

gccctcatcg tggtggccat cctgctggcc gccttcgggc tgctagtggc gctggtgggc 300

gccccagtgc ccaactgcgt gcaggacgac acggccaagg ccaagatcac catcgtggca 360

ggcgtgctgt tcttctcgc cgccctgctc accctcgtgc cggtgtcctg gtcggccaac 420

accattatcc gggacttcta caaccccgtg gtgcccgagg cgcagaagcg cgagatgggc 480

gcgggcctgt acgtgggctg ggcggccgcg gcgctgcagc tgctgggggg cgcgctgctc 540

tgctgctcgt gtccccacg cgagaagaag tacacggcca ccaaggtcgt ctactccgcg 600

ccgcgctcca ccggccgggg agccagcctg ggcacaggct acgaccgcaa ggactacgtc 660

<210> 13

<211> 213

<212> DNA

<400> 13

ggcttcttgg tgccttggtt catccctaag ggtcctaacc ggggagttat cattaccatg 120

ttggtgacct gttcagtttg ctgctatctc ttttggctga ttgcaattct ggcccaactc 180

aacccctctt ttggaccgca attgaaaaat gaaaccatct ggtatctgaa gtatcattgg 240

cct 243

<210> 14

<211> 903

<212> DNA

<213> Homo sapiens

<400> 14

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ccgggaacgc ggccgagtaa gcgacgcgcc tgctgggccc tgctgccgcc cgtgccctgc 120

tgcttgggct gcctggccga acgctggagg ctgcgtccgg ccgctcttgg cttgcggctg 180

cccgggatcg gccagcggaa ccactgttcg ggcgcgggga aggcggctcc caggccagcg 240

gccggagcgg gcgccgctgc cgaagccccg ggcggccagt ggggccccgc gagcaccccc 300

agcctgtatg aaaacccatg gacaatcccg aatatgttgt caatgacgag aattggcttg 360

gcccccagtt tgggctattt gattattgaa gaagatttta atattgcact aggagttttt 420

gctttagctg gactaacaga tttgttggat ggatttattg ctcgaaaactg ggccaatcaa 480

agatcagctt tgggaagtgc tcttgatcca cttgctgata aaatacttat cagtatctta 540

tatgttagct tgacctatgc agatcttatt ccagttccac ttacttacat gatcatttcg 600

agagatgtaa tgttgattgc tgctgttttt tatgtcagat accgaactct tccaacacca 660

gttttcaact atgctgacag catttatctt cagatactat ggtgttttac agctttcacc 840

gac 903

<210> 15

<211> 1149

<212> DNA

<213> Homo sapiens

<400> 15

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cgggtcaaga cctgcggggg cgccaccgtg accattgtca gtggccttct catgctgcta 120

ctgttcctgt ccgagctgca gttacctc accacggagg tgcatcctga gctctacgtg 180

gacaagtcgc ggggagataa actgaagatc aacatcgatg tacttttttcc gcacatgcct 240

tgtgcctatc tgagtattga tgccatggat gtggccggag aacagcagct ggatgtggaa 300

cacaacctgt tcaagcaacg actagataaa gatggcatcc ccgtgagctc agaggctgag 360

cggcatgagc ttgggaaagt cgaggtgacg gtgtttgacc ctgactcccc ggaccctgat 420

cgctgtgaga gctgctatgg tgctgaggca gaagatatca agtgctgtaa cacctgtgaa 480

gatgtgcggg aggcatatcg ccgtagaggc tgggccttca agaaccccaga tactattgag 540

cagtgccggc gagagggctt cagccagaag atgcaggagc agaagaatga aggctgccag 600

gtgtatggct tcttggaagt caataaggtg gccggaaact tccactttgc ccctgggaag 660

agcttccagc agtcccatgt gcacgtccat gacttgcaga gctttggcct tgacaacatc 720

aacatgaccc actacatcca gcacctgtca tttggggagg actatccagg cattgtgaac 780

ccccctggacc acaccaatgt cactgcgccc caagcctcca tgatgttcca gtactttgtg 840

gtcttcgtcc tctatgagct ctgcccatg atggtgaagc tgacggagaa gcacaggtcc 1020

ctcatcgatt cgctcatcta ccactcagca cgagccatcc agaagaaaat tgatctaggg 1140

aagacaacg 1149

<210> 16

<211> 597

<212> DNA

<213> Homo sapiens

<400> 16

atgacccggc tgctgggcta cgtggacccc ctggatccca gctttgtggc tgccgtcatc 60

accatcacct tcaatccgct ctactggaat gtggttgcac gatgggaaca caagacccgc 120

aagctgagca gggccttcgg atccccctac ctggcctgct actctctaag cgtcaccatc 180

ctgctcctga acttcctgcg ctcgcactgc ttcacgcagg ccatgctgag ccagcccagg 240

atggagagcc tggacacccc cgcggcctac agcctgggcc tcgcgctcct gggactgggc 300

gtcgtgctcg tgctctccag cttctttgca ctggggttcg ctggaacttt cctaggtgat 360

tacttcggga tcctcaagga ggcgagagtg accgtgttcc ccttcaacat cctggacaac 420

cccatgtact ggggaagcac agccaactac ctgggctggg ccatcatgca cgccagcccc 480

acgggcctgc tcctgacggt gctggtggcc ctcacctaca tagtggctct cctatacgaa 540

gagcccttca ccgctgagat ctaccggcag aaagcctccg ggtccccaca gaggagc 597

<210> 17

<211>

<212>

<213> Homo sapiens

<400> 17

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ctcgctctgg gcgtggaaag ggctctggcg ctacccgaga tatgcaccca atgtccaggg 120
agcgtgcaaa atttgtcaaa agtggccttt tattgtaaaa cgacacgaga gctaatgctg 180
catgcccgtt gctgcctgaa tcagaagggc accatcttgg ggctggatct ccagaactgt 240
tctctggagg accctggtcc aaactttcat caggcacata ccactgtcat catagacctg 300
caagcaaacc ccctcaaagg tgacttggcc aacaccttcc gtggctttac tcagctccag 360
actctgatac tgccacaaca tgtcaactgt cctggaggaa ttaatgcctg gaatactatc 420
acctcttata tagacaacca aatctgtcaa gggcaaaaga acctttgcaa taacactggg 480
gacccagaaa tgtgtcctga gaatggatct tgtgtacctg atggtccagg tctttttgcag 540
tgtgtttgtg ctgatggttt ccatggatac aagtgtatgc gccagggctc gttctcactg 600
cttatgttct tcgggattct gggagccacc actctatccg tctccattct gctttgggcg 660
acccagcgcc gaaaagccaa gacttca 687

<210> 18
<211> 534
<212> DNA
<213> Homo sapiens

<400> 18

atgtcgccct ctggtcgcct gtgtcttctc accatcgttg gcctgattct ccccaccaga 60
ggacagacgt tgaaagatac cacgtccagt tcttcagcag actcaactat catggacatt 120

acggatgggc [illegible] tagtgac agatccagag acacacaaga gcaccaaagc ag[illegible]tcatcc 300

ccccagaccc tcaagccatc tggttttcat gaggatgacc ccttcttcta tgatgaacac 420
accctccgga aacgggggct gttggtcgca gctgtgctgt tcatcacagg catcatcatc 480
ctcaccagtg gcaagtgcag gcagctgtcc cggttatgcc ggaatcattg cagg 534

<210> 19

<211> 1329

<212> DNA

<213> Homo sapiens

<400> 19

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ctctacgctg cctaccacgt cttcttcggg cgccgccgcc aggcgccggc cgggtccccg 120
cggggcctca ggaagggggc ggcccccgcg cgggagagac gcggccgaga acagtccact 180
ttggaaagtg aagaatggaa tccttgggaa ggagatgaaa aaaatgagca acaacacaga 240
tttaaaacta gccttcaaat attagataaa tccacgaaag gaaaaacaga tctcagtgta 300
caaatctggg gcaaagctgc cattggcttg tatctctggg agcatatttt tgaaggctta 360
cttgatccca gcgatgtgac tgctcaatgg agaggaaggaa agtcaatcgt aggaagaaca 420
cagtacagct tcatcactgg tccagctgta atacaagggt acttctccgt tgatgtgaat 480
aatgtggtac tcattttaaa tggaagagaa aaagcaaaga tcttttatgc cacccagtgg 540
ttactttatg cacaaaattt agtgcaaatt caaaaactcc agcatcttgc tgttgttttg 600
ctcggaaatg aacattgtga taatgagtgg ataaaccccat tcctcaaaag aaatggaggc 660
ttcgtggagc tgcttttcat aatatatgac agccctgga ttaatgacgt ggatgttttt 720

tccagacagg cactaatgaa catttgaaa aaagatggga acgataagct ttgttgggtt 900

gccttgcttc agagtgatct cacattgtgc ccggtcggag taaacacaga atgctatcga 1020

atctatgagg cttgctccta tggctccatt cctgtggtgg aagacgtgat gacagctggc 1080

aactgtggga atacatctgt gcaccacggt gctcctctgc agttactcaa gtccatgggt 1140

gctccctta tctttatcaa gaactggaag gaactccctg ctgttttaga aaaagagaaa 1200

actataattt tacaagaaaa aattgaaaga agaaaaatgt tacttcagtg gtatcagcac 1260

ttcaagacag agcttaaaat gaaatttact aatattttag aaagctcatt tttaatgaat 1320

aataaaagt 1329

<210> 20

<211> 390

<212> DNA

<213> Homo sapiens

<400> 20

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ttcctgttca tcgtctattt ggtcttgctg gccaacggcc tctggtgttc caaggccagg 180

gctgaggacg aggaggagac cacgttcaga atggagtcca acctatacca ggaccagagt 240

gaagacaaga gagagaagaa agaggccaag gagaaagaag agaagaggaa gaaggagaaa 300

aagacagcaa aggaaggaga gagcaacttg ggactggatc tggaggaaaa agagcccgga 360

gaccatgaga gagcaaagag cacagtcatg 390

<211> 979

<213> Homo sapiens

<400> 21

agcccaccag tgacc atg aag gct gtg ctg ctt gcc ctg ttg atg gca ggc 51

Met Lys Ala Val Leu Leu Ala Leu Leu Met Ala Gly

1 5 10

ttg gcc ctg cag cca ggc act gcc ctg ctg tgc tac tcc tgc aaa gcc 99

Leu Ala Leu Gln Pro Gly Thr Ala Leu Leu Cys Tyr Ser Cys Lys Ala

15 20 25

cag gtg agc aac gag gac tgc ctg cag gtg aag aac tgc acc cag ctg 147

Gln Val Ser Asn Glu Asp Cys Leu Gln Val Lys Asn Cys Thr Gln Leu

30 35 40

ggg gag cag tgc tgg acc gcg cgc atc cgc gca gtt ggc ctc ctg acc 195

Gly Glu Gln Cys Trp Thr Ala Arg Ile Arg Ala Val Gly Leu Leu Thr

45 50 55 60

gtc atc agc aaa ggc tgc agc ttg aac tgc gtg gat gac tca cag gac 243

Val Ile Ser Lys Gly Cys Ser Leu Asn Cys Val Asp Asp Ser Gln Asp

65 70 75

tac tac gtg ggc aag aag aac atc acg tgc tgt gac acc gac ttg tgc 291

Tyr Tyr Val Gly Lys Lys Asn Ile Thr Cys Cys Asp Thr Asp Leu Cys

80 85 90

aac gcc agc ggg gcc cat gcc ctg cag ccg gct gcc gcc atc ctt gcg 339

Asn Ala Ser Gly Ala His Ala Leu Gln Pro Ala Ala Ala Ile Leu Ala

Leu Leu Pro Ala Leu Gly Leu Leu Leu Trp Gly Pro Gly Gln Leu

tagget ctgggggggcc ccgctgcagc ccacactggg tgtggtgccc caggcctctg 440

tgccactcct cacagacctg gcccagtggg agcctgtcct ggttcctgag gcacatccta 500

acgcaagtct gaccatgtat gtctgcaccc ctgtcccccca cccctgaccct cccatggccc 560

tctccaggac tcccacccgg cagatcaget ctagtgacac agatccgcct gcagatggcc 620

cctccaaccc tctctgctgc tgtttccatg gcccagcatt ctccaccctt aaccctgtgc 680

tcaggcacct cttccccccag gaagccttcc ctgcccaccc catctatgac ttgagccagg 740

tctggtccgt ggtgtccccc gcacccagca ggggacaggc actcaggagg gcccagtaaa 800

ggctgagatg aagtggactg agtagaactg gaggacaaga gtcgacgtga gttcctggga 860

gtctccagag atggggcctg gaggcctgga ggaaggggcc aggcctcaca ttcgtggggc 920

tcccctgaatg gcagcctgag cacagcgtag gcccttaata aacaccctgtt ggataagcc 979

<210> 22

<211> 123

<212> PRT

<213> Homo sapiens

400> 22

Met Lys Ala Val Leu Leu Ala Leu Leu Met Ala Gly

1 5 10

Leu Ala Leu Gln Pro Gly Thr Ala Leu Leu Cys Tyr Ser Cys Lys Ala

15 20 25

Gln Val Ser Asn Glu Asp Cys Leu Gln Val Lys Asn Cys Thr Gln Leu

45 50 55 60

65 70 75

Tyr Tyr Val Gly Lys Lys Asn Ile Thr Cys Cys Asp Thr Asp Leu Cys

80 85 90

Asn Ala Ser Gly Ala His Ala Leu Gln Pro Ala Ala Ala Ile Leu Ala

95 100 105

Leu Leu Pro Ala Leu Gly Leu Leu Leu Trp Gly Pro Gly Gln Leu

110 115 120

<210> 23

<211> 1279

<212> DNA

<213> Homo sapiens

<400> 23

agggccagcc cagtcgccgc cgcccgccca caaagccaca ggcaggtgca ggcgcagccg 60

cggcgagagc gtatggagcc gagccgttag cgcgcgccgt cggtgagtca gtccgtccgt 120

ccgtccgtcc gtcgggggcgc cgcagctccc gccaggccca gcggcccccgg ccccctcgtct 180

ccccgcaccc ggagccaccc ggtggagcgg gccttgcccgc ggcagcc atg tcc atg 236

Met Ser Met

1

ggc ctg gag atc acg ggc acc gcg ctg gcc gtg ctg ggc tgg ctg ggc 284

Gly Leu Glu Ile Thr Gly Thr Ala Leu Ala Val Leu Gly Trp Leu Gly

Thr Ile Val Cys Cys Ala Leu Pro Met Trp Arg Val Ser Ala Phe Ile

ggc agc aac atc atc acg tcg cag aac atc tgg gag ggc ctg tgg atg 380
Gly Ser Asn Ile Ile Thr Ser Gln Asn Ile Trp Glu Gly Leu Trp Met
40 45 50

aac tgc gtg gtg cag agc acc ggc cag atg cag tgc aag gtg tac gac 428
Asn Cys Val Val Gln Ser Thr Gly Gln Met Gln Cys Lys Val Tyr Asp
55 60 65

tcg ctg ctg gca ctg cca cag gac ctt cag gcg gcc cgc gcc ctc atc 476
Ser Leu Leu Ala Leu Pro Gln Asp Leu Gln Ala Ala Arg Ala Leu Ile
70 75 80

gtg gtg gcc atc ctg ctg gcc gcc ttc ggg ctg cta gtg gcg ctg gtg 524
Val Val Ala Ile Leu Leu Ala Ala Phe Gly Leu Leu Val Ala Leu Val
85 90 95

ggc gcc cag tgc acc aac tgc gtg cag gac gac acg gcc aag gcc aag 572
Gly Ala Gln Cys Thr Asn Cys Val Gln Asp Asp Thr Ala Lys Ala Lys
100 105 110 115

atc acc atc gtg gca ggc gtg ctg ttc ctt ctc gcc gcc ctg ctc acc 620
Ile Thr Ile Val Ala Gly Val Leu Phe Leu Leu Ala Ala Leu Leu Thr
120 125 130

ctc gtg ccg gtg tcc tgg tcg gcc aac acc att atc cgg gac ttc tac 668
Leu Val Pro Val Ser Trp Ser Ala Asn Thr Ile Ile Arg Asp Phe Tyr
135 140 145

aac ccc gtg gtg ccc gag gcg cag aag cgc gag atg ggc gcg ggc ctg 716
Asn Pro Val Val Pro Glu Ala Gln Lys Arg Glu Met Gly Ala Gly Leu

Tyr Val Gly Trp Ala Ala Val Ala Leu Gln Leu Leu Gly Gly Ala Leu

ctc tgc tgc tcg tgt ccc cca cgc gag aag aag tac acg gcc acc aag 812
Leu Cys Cys Ser Cys Pro Pro Arg Glu Lys Lys Tyr Thr Ala Thr Lys
180 185 190 195

gtc gtc tac tcc gcg ccg cgc tcc acc ggc ccg gga gcc agc ctg ggc 860
Val Val Tyr Ser Ala Pro Arg Ser Thr Gly Pro Gly Ala Ser Leu Gly
200 205 210

aca ggc tac gac cgc aag gac tac gtc taa gggacagacg cagggagacc 910
Thr Gly Tyr Asp Arg Lys Asp Tyr Val
215 220

ccaccaccac caccaccacc aacaccacca ccaccacagc gagctggagc gcgcaccagg 970

ccatccagcg tgcagccttg cctcggaggc cagcccaccc ccagaagcca ggaagccccc 1030

gcgctggact ggggcagctt ccccagcagc cacggctttg cgggccgggc agtcgacttc 1090

ggggcccagg gaccaacctg catggactgt gaaacctcac ccttctggag cacggggcct 1150

gggtgaccgc caatacttga ccaccccgtc gagccccatc gggccgctgc ccccatgctc 1210

gcgctgggca gggaccggca gccctggaag gggcacttga tatttttcaa taaaagcctt 1270

tcgttttgc 1279

<210> 24

<211> 220

<212> PRT

<213> Homo sapiens

5 10 15

Thr Ile Val Cys Cys Ala Leu Pro Met Trp Arg Val Ser Ala Phe Ile

20 25 30 35

Gly Ser Asn Ile Ile Thr Ser Gln Asn Ile Trp Glu Gly Leu Trp Met

40 45 50

Asn Cys Val Val Gln Ser Thr Gly Gln Met Gln Cys Lys Val Tyr Asp

55 60 65

Ser Leu Leu Ala Leu Pro Gln Asp Leu Gln Ala Ala Arg Ala Leu Ile

70 75 80

Val Val Ala Ile Leu Leu Ala Ala Phe Gly Leu Leu Val Ala Leu Val

85 90 95

Gly Ala Gln Cys Thr Asn Cys Val Gln Asp Asp Thr Ala Lys Ala Lys

100 105 110 115

Ile Thr Ile Val Ala Gly Val Leu Phe Leu Leu Ala Ala Leu Leu Thr

120 125 130

Leu Val Pro Val Ser Trp Ser Ala Asn Thr Ile Ile Arg Asp Phe Tyr

135 140 145

Asn Pro Val Val Pro Glu Ala Gln Lys Arg Glu Met Gly Ala Gly Leu

150 155 160

Tyr Val Gly Trp Ala Ala Ala Ala Leu Gln Leu Leu Gly Gly Ala Leu

165 170 175

Leu Cys Cys Ser Cys Pro Pro Arg Glu Lys Lys Tyr Thr Ala Thr Lys

180 185 190 195

Thr Gly Tyr Asp Arg Lys Asp Tyr Val

<210> 25

<211> 835

<212> DNA

<213> Homo sapiens

<400> 25

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cc atg gcg tat cac ggc ctc act gtg cct ctc att gtg atg agc gtg 107
Met Ala Tyr His Gly Leu Thr Val Pro Leu Ile Val Met Ser Val
1 5 10 15

ttc tgg ggc ttc gtc ggc ttc ttg gtg cct tgg ttc atc cct aag ggt 155
Phe Trp Gly Phe Val Gly Phe Leu Val Pro Trp Phe Ile Pro Lys Gly
20 25 30

cct aac cgg gga gtt atc att acc atg ttg gtg acc tgt tca gtt tgc 203
Pro Asn Arg Gly Val Ile Ile Thr Met Leu Val Thr Cys Ser Val Cys
35 40 45

tgc tat ctc ttt tgg ctg att gca att ctg gcc caa ctc aac cct ctc 251
Cys Tyr Leu Phe Trp Leu Ile Ala Ile Leu Ala Gln Leu Asn Pro Leu
50 55 60

ttt gga ccg caa ttg aaa aat gaa acc atc tgg tat ctg aag tat cat 299
Phe Gly Pro Gln Leu Lys Asn Glu Thr Ile Trp Tyr Leu Lys Tyr His

Trp Pro

agaagagaat gccttctaga tgcaaaatca cctccaaacc agaccacttt tcttgacttg 410

cctgttttgg ccattagctg ccttaaacgt taacagcaca tttgaatgcc ttattctaca 470

atgcagcgtg ttttcctttg cctttttttgc actttggtga attacgtgcc tccataacct 530

gaactgtgcc gactccacaa aacgattatg tactcttctg agatagaaga tgctgttctt 590

ctgagagata cgttactctc tccttggaat ctgtggattt gaagatggct cctgccttct 650

cacgtgggaa tcagtgaagt gtttagaaac tgctgcaaga caaacaagac tccagtgggg 710

tggtcagtag gagagcacgt tcagagggaa gagccatctc aacagaatcg caccaaacta 770

tactttcagg atgaatttct tctttctgcc atcttttgga ataaatattt tcctccttte 830

tatgg 835

<210> 26

<211> 81

<212> PRT

<213> Homo sapiens

<400> 26

Met Ala Tyr His Gly Leu Thr Val Pro Leu Ile Val Met Ser Val
1 5 10 15

Phe Trp Gly Phe Val Gly Phe Leu Val Pro Trp Phe Ile Pro Lys Gly
20 25 30

Pro Asn Arg Gly Val Ile Ile Thr Met Leu Val Thr Cys Ser Val Cys
35 40 45

Phe Gly Pro Gln Leu Lys Asn Glu Thr Ile Trp Tyr Leu Lys Tyr His

Trp Pro

80

<210> 27

<211> 1256

<212> DNA

<213> Homo sapiens

<400> 27

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ctcgccagtg tcccaggctg ctgagctctc gccgccccgag accccgcggc gcggccgcag 120

ggcc atg cta gcc ttg cgc gtg gcg cgc ggc tcg tgg ggg gcc ctg cgc 169

Met Leu Ala Leu Arg Val Ala Arg Gly Ser Trp Gly Ala Leu Arg

1 5 10 15

ggc gcc gct tgg gct ccg gga acg cgg ccg agt aag cga cgc gcc tgc 217

Gly Ala Ala Trp Ala Pro Gly Thr Arg Pro Ser Lys Arg Arg Ala Cys

20 25 30

tgg gcc ctg ctg ccg ccc gtg ccc tgc tgc ttg ggc tgc ctg gcc gaa 265

Trp Ala Leu Leu Pro Pro Val Pro Cys Cys Leu Gly Cys Leu Ala Glu

35 40 45

cgc tgg agg ctg cgt ccg gcc gct ctt ggc ttg cgg ctg ccc ggg atc 313

Arg Trp Arg Leu Arg Pro Ala Ala Leu Gly Leu Arg Leu Pro Gly Ile

[illegible]

Gly Gln Arg Asn His Lys Ser Gly Ala Gly Lys Ala Ala Pro Arg Pro

gcg gcc gga gcg ggc gcc gct gcc gaa gcc ccg ggc ggc cag tgg ggc 409
Ala Ala Gly Ala Gly Ala Ala Ala Glu Ala Pro Gly Gly Gln Trp Gly
80 85 90 95

ccg gcg agc acc ccc agc ctg tat gaa aac cca tgg aca atc ccg aat 457
Pro Ala Ser Thr Pro Ser Leu Tyr Glu Asn Pro Trp Thr Ile Pro Asn
100 105 110

atg ttg tca atg acg aga att ggc ttg gcc cca gtt ctg ggc tat ttg 505
Met Leu Ser Met Thr Arg Ile Gly Leu Ala Pro Val Leu Gly Tyr Leu
115 120 125

att att gaa gaa gat ttt aat att gca cta gga gtt ttt gct tta gct 553
Ile Ile Glu Glu Asp Phe Asn Ile Ala Leu Gly Val Phe Ala Leu Ala
130 135 140

gga cta aca gat ttg ttg gat gga ttt att gct cga aac tgg gcc aat 601
Gly Leu Thr Asp Leu Leu Asp Gly Phe Ile Ala Arg Asn Trp Ala Asn
145 150 155

caa aga tca gct ttg gga agt gct ctt gat cca ctt gct gat aaa ata 649
Gln Arg Ser Ala Leu Gly Ser Ala Leu Asp Pro Leu Ala Asp Lys Ile
160 165 170 175

ctt atc agt atc tta tat gtt agc ttg acc tat gca gat ctt att cca 697
Leu Ile Ser Ile Leu Tyr Val Ser Leu Thr Tyr Ala Asp Leu Ile Pro
180 185 190

gtt cca ctt act tac atg atc att tcg aga gat gta atg ttg att gct 745
Val Pro Leu Thr Tyr Met Ile Ile Ser Arg Asp Val Met Leu Ile Ala

Ala Val Phe Tyr Val Arg Tyr Arg Thr Leu Pro Thr Pro Arg Thr Leu

gcc aag tat ttc aat cct tgc tat gcc act gct agg tta aaa cca aca 841
Ala Lys Tyr Phe Asn Pro Cys Tyr Ala Thr Ala Arg Leu Lys Pro Thr
225 230 235

ttc atc agc aag gtg aat aca gca gtc cag tta atc ttg gtg gca gct 889
Phe Ile Ser Lys Val Asn Thr Ala Val Gln Leu Ile Leu Val Ala Ala
240 245 250 255

tct ttg gca gct cca gtt ttc aac tat gct gac agc att tat ctt cag 937
Ser Leu Ala Ala Pro Val Phe Asn Tyr Ala Asp Ser Ile Tyr Leu Gln
260 265 270

ata cta tgg tgt ttt aca gct ttc acc aca gct gca tca gct tat agt 985
Ile Leu Trp Cys Phe Thr Ala Phe Thr Thr Ala Ala Ser Ala Tyr Ser
275 280 285

tac tat cat tat ggc cgg aag act gtt cag gtg ata aaa gac tga 1030
Tyr Tyr His Tyr Gly Arg Lys Thr Val Gln Val Ile Lys Asp
290 295 300

tgaaagtcat ccctcactgt tagtaaggaa gcagtataca tcaatgggaa cagggcccat 1090

ggaaatgtac aggagtttcc ctattttggt gttcagcttg aaaaaggact tgtcagaatc 1150

aactgtgtca tcaaaatttta agtaatgtgc attgaaaata aggttgatca tgggaatatg 1210

cagaatttcc aatgtatttt taaatacaaa taaaattgta atttag 1256

<210> 28

<211> 301

Met Leu Ala Leu Arg Val Ala Arg Gly Ser Trp Gly Ala Leu Arg
1 5 10 15

Gly Ala Ala Trp Ala Pro Gly Thr Arg Pro Ser Lys Arg Arg Ala Cys
20 25 30

Trp Ala Leu Leu Pro Pro Val Pro Cys Cys Leu Gly Cys Leu Ala Glu
35 40 45

Arg Trp Arg Leu Arg Pro Ala Ala Leu Gly Leu Arg Leu Pro Gly Ile
50 55 60

Gly Gln Arg Asn His Cys Ser Gly Ala Gly Lys Ala Ala Pro Arg Pro
65 70 75

Ala Ala Gly Ala Gly Ala Ala Ala Glu Ala Pro Gly Gly Gln Trp Gly
80 85 90 95

Pro Ala Ser Thr Pro Ser Leu Tyr Glu Asn Pro Trp Thr Ile Pro Asn
100 105 110

Met Leu Ser Met Thr Arg Ile Gly Leu Ala Pro Val Leu Gly Tyr Leu
115 120 125

Ile Ile Glu Glu Asp Phe Asn Ile Ala Leu Gly Val Phe Ala Leu Ala
130 135 140

Gly Leu Thr Asp Leu Leu Asp Gly Phe Ile Ala Arg Asn Trp Ala Asn
145 150 155

Gln Arg Ser Ala Leu Gly Ser Ala Leu Asp Pro Leu Ala Asp Lys Ile
160 165 170 175

Leu Ile Ser Ile Leu Tyr Val Ser Leu Thr Tyr Ala Asp Leu Ile Pro
195 200 205

210 215 220

Ala Lys Tyr Phe Asn Pro Cys Tyr Ala Thr Ala Arg Leu Lys Pro Thr

225 230 235

Phe Ile Ser Lys Val Asn Thr Ala Val Gln Leu Ile Leu Val Ala Ala

240 245 250 255

Ser Leu Ala Ala Pro Val Phe Asn Tyr Ala Asp Ser Ile Tyr Leu Gln

260 265 270

Ile Leu Trp Cys Phe Thr Ala Phe Thr Thr Ala Ala Ser Ala Tyr Ser

275 280 285

Tyr Tyr His Tyr Gly Arg Lys Thr Val Gln Val Ile Lys Asp

290 295 300

<210> 29

<211> 1305

<212> DNA

<213> Homo sapiens

<400> 29

ttttttttcc ggccggtccc c atg gag gcg ctg ggg aag ctg aag cag ttc 51

Met Glu Ala Leu Gly Lys Leu Lys Gln Phe

1 5 10

gat gcc tac ccc aag act ttg gag gac ttc cgg gtc aag acc tgc ggg 99

ggc gcc acc gtg acc att gtc agt ggc ctt ctc atg ctg ctg ctg ttc 147

30 35 40

ctg tcc gag ctg cag tat tac ctc acc acg gag gtg cat cct gag ctc 195
Leu Ser Glu Leu Gln Tyr Tyr Leu Thr Thr Glu Val His Pro Glu Leu

45 50 55

tac gtg gac aag tcg cgg gga gat aaa ctg aag atc aac atc gat gta 243
Tyr Val Asp Lys Ser Arg Gly Asp Lys Leu Lys Ile Asn Ile Asp Val

60 65 70

ctt ttt ccg cac atg cct tgt gcc tat ctg agt att gat gcc atg gat 291
Leu Phe Pro His Met Pro Cys Ala Tyr Leu Ser Ile Asp Ala Met Asp

75 80 85 90

gtg gcc gga gaa cag cag ctg gat gtg gaa cac aac ctg ttc aag caa 339
Val Ala Gly Glu Gln Gln Leu Asp Val Glu His Asn Leu Phe Lys Gln

95 100 105

cga cta gat aaa gat ggc atc ccc gtg agc tca gag gct gag cgg cat 387
Arg Leu Asp Lys Asp Gly Ile Pro Val Ser Ser Glu Ala Glu Arg His

110 115 120

gag ctt ggg aaa gtc gag gtg acg gtg ttt gac cct gac tcc ctg gac 435
Glu Leu Gly Lys Val Glu Val Thr Val Phe Asp Pro Asp Ser Leu Asp

125 130 135

cct gat cgc tgt gag agc tgc tat ggt gct gag gca gaa gat atc aag 483
Pro Asp Arg Cys Glu Ser Cys Tyr Gly Ala Glu Ala Glu Asp Ile Lys

140 145 150

tgc tct agc acc tgt gta gat gtg cgg gag gca tat cgc cgt aga ggc 531

[illegible]

tgg gcc ttc aag aac cca gat act att gag cag tgc cgg cga gag ggc 579

175 180 185

ttc agc cag aag atg cag gag cag aag aat gaa ggc tgc cag gtg tat 627
Phe Ser Gln Lys Met Gln Glu Gln Lys Asn Glu Gly Cys Gln Val Tyr

190 195 200

ggc ttc ttg gaa gtc aat aag gtg gcc gga aac ttc cac ttt gcc cct 675
Gly Phe Leu Glu Val Asn Lys Val Ala Gly Asn Phe His Phe Ala Pro

205 210 215

ggg aag agc ttc cag cag tcc cat gtg cac gtc cat gac ttg cag agc 723
Gly Lys Ser Phe Gln Gln Ser His Val His Val His Asp Leu Gln Ser

220 225 230

ttt ggc ctt gac aac atc aac atg acc cac tac atc cag cac ctg tca 771
Phe Gly Leu Asp Asn Ile Asn Met Thr His Tyr Ile Gln His Leu Ser

235 240 245 250

ttt ggg gag gac tat cca ggc att gtg aac ccc ctg gac cac acc aat 819
Phe Gly Glu Asp Tyr Pro Gly Ile Val Asn Pro Leu Asp His Thr Asn

255 260 265

gtc act gcg ccc caa gcc tcc atg atg ttc cag tac ttt gtg aag gtg 867
Val Thr Ala Pro Gln Ala Ser Met Met Phe Gln Tyr Phe Val Lys Val

270 275 280

gtg ccc act gtg tac atg aag gtg gac gga gag gta ctg agg aca aat 915
Val Pro Thr Val Tyr Met Lys Val Asp Gly Glu Val Leu Arg Thr Asn

285 290 295

[illegible] 963

gac caa ggc ctt ccc gga gtc ttc gtc ctc tat gag ctc tcg ccc atg 1011

315 320 325 330

atg gtg aag ctg acg gag aag cac agg tcc ttc acc cac ttc ctg aca 1059
Met Val Lys Leu Thr Glu Lys His Arg Ser Phe Thr His Phe Leu Thr

335 340 345

ggt gtg tgc gcc atc att ggg ggc atg ttc aca gtg gct gga ctc atc 1107
Gly Val Cys Ala Ile Ile Gly Gly Met Phe Thr Val Ala Gly Leu Ile

350 355 360

gat tcg ctc atc tac cac tca gca cga gcc atc cag aag aaa att gat 1155
Asp Ser Leu Ile Tyr His Ser Ala Arg Ala Ile Gln Lys Lys Ile Asp

365 370 375

cta ggg aag aca acg tagtcaccct cggtgcttcc tctgtctcct ctttctccct 1210
Leu Gly Lys Thr Thr

380

ggcctgtggt tgtcccccag cctctgccac cctccaccct ctcggtcagc cccagcccca 1270

ggttgataaa tctattgatt gattgtgata gtaac 1305

(210) 30

(211) 383

(212) PRT

(213) Homo sapiens

(400) 20

Asp Ala Tyr Pro Lys Thr Leu Glu Asp Phe Arg Val Lys Thr Cys Gly

Gly Ala Thr Val Thr Ile Val Ser Gly Leu Leu Met Leu Leu Leu Phe
30 35 40
Leu Ser Glu Leu Gln Tyr Tyr Leu Thr Thr Glu Val His Pro Glu Leu
45 50 55
Tyr Val Asp Lys Ser Arg Gly Asp Lys Leu Lys Ile Asn Ile Asp Val
60 65 70
Leu Phe Pro His Met Pro Cys Ala Tyr Leu Ser Ile Asp Ala Met Asp
75 80 85 90
Val Ala Gly Glu Gln Gln Leu Asp Val Glu His Asn Leu Phe Lys Gln
95 100 105
Arg Leu Asp Lys Asp Gly Ile Pro Val Ser Ser Glu Ala Glu Arg His
110 115 120
Glu Leu Gly Lys Val Glu Val Thr Val Phe Asp Pro Asp Ser Leu Asp
125 130 135
Pro Asp Arg Cys Glu Ser Cys Tyr Gly Ala Glu Ala Glu Asp Ile Lys
140 145 150
Cys Cys Asn Thr Cys Glu Asp Val Arg Glu Ala Tyr Arg Arg Arg Gly
155 160 165 170
Trp Ala Phe Lys Asn Pro Asp Thr Ile Glu Gln Cys Arg Arg Glu Gly
175 180 185
Phe Ser Gln Lys Met Glu Glu Gln Lys Asn Glu Gly Cys Gln Val Tyr
190 195 200
Gly Phe Leu Glu Val Asn Lys Val Ala Gly Asn Phe His Phe Ala Pro
205 210 215 220 225 230

235 240 245 250

Phe Gly Glu Asp Tyr Pro Gly Ile Val Asn Pro Leu Asp His Thr Asn

255 260 265

Val Thr Ala Pro Gln Ala Ser Met Met Phe Gln Tyr Phe Val Lys Val

270 275 280

Val Pro Thr Val Tyr Met Lys Val Asp Gly Glu Val Leu Arg Thr Asn

285 290 295

Gln Phe Ser Val Thr Arg His Glu Lys Val Ala Asn Gly Leu Leu Gly

300 305 310

Asp Gln Gly Leu Pro Gly Val Phe Val Leu Tyr Glu Leu Ser Pro Met

315 320 325 330

Met Val Lys Leu Thr Glu Lys His Arg Ser Phe Thr His Phe Leu Thr

335 340 345

Gly Val Cys Ala Ile Ile Gly Gly Met Phe Thr Val Ala Gly Leu Ile

350 355 360

Asp Ser Leu Ile Tyr His Ser Ala Arg Ala Ile Gln Lys Lys Ile Asp

365 370 375

Leu Gly Lys Thr Thr

380

<210> 31

<211> 899

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agacttctgc gtt atg acc cgg ctg ctg ggc tac gtg gac ccc ctg gat 109

Met Thr Arg Leu Leu Gly Tyr Val Asp Pro Leu Asp

1 5 10

ccc agc ttt gtg gct gcc gtc atc acc atc acc ttc aat ccg ctc tac 157

Pro Ser Phe Val Ala Ala Val Ile Thr Ile Thr Phe Asn Pro Leu Tyr

15 20 25

tgg aat gtg gtt gca cga tgg gaa cac aag acc cgc aag ctg agc agg 205

Trp Asn Val Val Ala Arg Trp Glu His Lys Thr Arg Lys Leu Ser Arg

30 35 40

gcc ttc gga tcc ccc tac ctg gcc tgc tac tct cta agc gtc acc atc 253

Ala Phe Gly Ser Pro Tyr Leu Ala Cys Tyr Ser Leu Ser Val Thr Ile

45 50 55 60

ctg ctc ctg aac ttc ctg cgc tcg cac tgc ttc acg cag gcc atg ctg 301

Leu Leu Leu Asn Phe Leu Arg Ser His Cys Phe Thr Gln Ala Met Leu

65 70 75

agc cag ccc agg atg gag agc ctg gac acc ccc gcg gcc tac agc ctg 349

Ser Gln Pro Arg Met Glu Ser Leu Asp Thr Pro Ala Ala Tyr Ser Leu

80 85 90

ggc ctc gcg ctc ctg gga ctg ggc gtc gtg ctc gtg ctc tcc agc ttc 397

Gly Leu Ala Leu Leu Gly Leu Gly Val Val Leu Val Leu Ser Ser Phe

95 100 105

ttt gcc ctg ggg ttc gct gga act ttc cta ggt gat tac ttc ggg atc 445

[illegible]

ctc aag gag gcg aga gtg acc gtg ttc ccc tt aac atc ctg gac aac 493

125 130 135 140

ccc atg tac tgg gga agc aca gcc aac tac ctg ggc tgg gcc atc atg 541
Pro Met Tyr Trp Gly Ser Thr Ala Asn Tyr Leu Gly Trp Ala Ile Met

145 150 155

cac gcc agc ccc acg ggc ctg ctc ctg acg gtg ctg gtg gcc ctc acc 589
His Ala Ser Pro Thr Gly Leu Leu Leu Thr Val Leu Val Ala Leu Thr

160 165 170

tac ata gtg gct ctc cta tac gaa gag ccc ttc acc gct gag atc tac 637
Tyr Ile Val Ala Leu Leu Tyr Glu Glu Pro Phe Thr Ala Glu Ile Tyr

175 180 185

cgg cag aaa gcc tcc ggg tcc cac aag agg agc tgattgagct gcaacagctt 690
Arg Gln Lys Ala Ser Gly Ser His Lys Arg Ser

190 195

tgctgaaggc ctggccagcc tcctggcctg ccccaagtgg caggccctgc gcagggcgag 750
aatggtgcct gctgctcagg gctcgccccc ggcgtgggct gccccagtgc cttggaacct 810
gctgccttgg ggaccctgga cgtgccgaca tatggccatt gagctccaac ccacacattc 870
ccattcacca ataaaggcac cctgaccccc 899

<210> 32

<211> 199

<212> PRT

<213> Homo sapiens

<400> 32

Met Thr Arg Leu Leu Val Tyr Val Asp Pro Leu Asp

Pro Ser Phe Val Ala Ala Val Ile Thr Ile Thr Phe Asn Pro Leu Tyr
15 20 25
Trp Asn Val Val Ala Arg Trp Glu His Lys Thr Arg Lys Leu Ser Arg
30 35 40
Ala Phe Gly Ser Pro Tyr Leu Ala Cys Tyr Ser Leu Ser Val Thr Ile
45 50 55 60
Leu Leu Leu Asn Phe Leu Arg Ser His Cys Phe Thr Gln Ala Met Leu
65 70 75
Ser Gln Pro Arg Met Glu Ser Leu Asp Thr Pro Ala Ala Tyr Ser Leu
80 85 90
Gly Leu Ala Leu Leu Gly Leu Gly Val Val Leu Val Leu Ser Ser Phe
95 100 105
Phe Ala Leu Gly Phe Ala Gly Thr Phe Leu Gly Asp Tyr Phe Gly Ile
110 115 120
Leu Lys Glu Ala Arg Val Thr Val Phe Pro Phe Asn Ile Leu Asp Asn
125 130 135 140
Pro Met Tyr Trp Gly Ser Thr Ala Asn Tyr Leu Gly Trp Ala Ile Met
145 150 155
His Ala Ser Pro Thr Gly Leu Leu Leu Thr Val Leu Val Ala Leu Thr
160 165 170
Tyr Ile Val Ala Leu Leu Tyr Glu Glu Pro Phe Thr Ala Glu Ile Tyr
175 180 185
Arg Glu Lys Ala Ser Gly Ser His Lys Arg Ser

<211> 905

<212> DNA

<213> Homo sapiens

<400> 33

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        Met Ala Pro His Gly Pro Gly Ser Leu Thr Thr Leu Val Pro
          1               5                  10

tgg gct gcc gcc ctg ctc ctc gct ctg ggc gtg gaa agg gct ctg gcg      98
Trp Ala Ala Ala Leu Leu Leu Ala Leu Gly Val Glu Arg Ala Leu Ala
 15                  20                  25                  30

cta ccc gag ata tgc acc caa tgt cca ggg agc gtg caa aat ttg tca     146
Leu Pro Glu Ile Cys Thr Gln Cys Pro Gly Ser Val Gln Asn Leu Ser
                 35                  40                  45

aaa gtg gcc ttt tat tgt aaa acg aca cga gag cta atg ctg cat gcc     194
Lys Val Ala Phe Tyr Cys Lys Thr Thr Arg Glu Leu Met Leu His Ala
             50                  55                  60

cgt tgc tgc ctg aat cag aag ggc acc atc ttg ggg ctg gat ctc cag     242
Arg Cys Cys Leu Asn Gln Lys Gly Thr Ile Leu Gly Leu Asp Leu Gln
         65                  70                  75

aac tgt tct ctg gag gac cct ggt cca aac ttt cat cag gca cat acc     290
Asn Cys Ser Leu Glu Asp Pro Gly Pro Asn Phe His Gln Ala His Thr
     80                  85                  90

                                                                    ...

 95                 100                 105                 110
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Asn Thr Phe Arg Gly Phe Thr Gln Leu Gln Thr Leu Ile Leu Pro Gln

115 120 125

cat gtc aac tgt cct gga gga att aat gcc tgg aat act atc acc tct 434

His Val Asn Cys Pro Gly Gly Ile Asn Ala Trp Asn Thr Ile Thr Ser

130 135 140

tat ata gac aac caa atc tgt caa ggg caa aag aac ctt tgc aat aac 482

Tyr Ile Asp Asn Gln Ile Cys Gln Gly Gln Lys Asn Leu Cys Asn Asn

145 150 155

act ggg gac cca gaa atg tgt cct gag aat gga tct tgt gta cct gat 530

Thr Gly Asp Pro Glu Met Cys Pro Glu Asn Gly Ser Cys Val Pro Asp

160 165 170

ggt cca ggt ctt ttg cag tgt gtt tgt gct gat ggt ttc cat gga tac 578

Gly Pro Gly Leu Leu Gln Cys Val Cys Ala Asp Gly Phe His Gly Tyr

175 180 185 190

aag tgt atg cgc cag ggc tcg ttc tca ctg ctt atg ttc ttc ggg att 626

Lys Cys Met Arg Gln Gly Ser Phe Ser Leu Leu Met Phe Phe Gly Ile

195 200 205

ctg gga gcc acc act cta tcc gtc tcc att ctg ctt tgg gcg acc cag 674

Leu Gly Ala Thr Thr Leu Ser Val Ser Ile Leu Leu Trp Ala Thr Gln

210 215 220

cgc cga aaa gcc aag act tca tgaac tacataggtc ttaccattga 720

Arg Arg Lys Ala Lys Thr Ser

225

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<210> 34

<211> 229

<212> PRT

<213> Homo sapiens

<400> 34

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Trp Ala Ala Ala Leu Leu Leu Ala Leu Gly Val Glu Arg Ala Leu Ala
15 20 25 30

Leu Pro Glu Ile Cys Thr Gln Cys Pro Gly Ser Val Gln Asn Leu Ser
35 40 45

Lys Val Ala Phe Tyr Cys Lys Thr Thr Arg Glu Leu Met Leu His Ala
50 55 60

Arg Cys Cys Leu Asn Gln Lys Gly Thr Ile Leu Gly Leu Asp Leu Gln
65 70 75

Asn Cys Ser Leu Glu Asp Pro Gly Pro Asn Phe His Gln Ala His Thr
80 85 90

Thr Val Ile Ile Asp Leu Gln Ala Asn Pro Leu Lys Gly Asp Leu Ala
95 100 105 110

Asn Thr Phe Arg Gly Phe Thr Gln Leu Gln Thr Leu Ile Leu Pro Gln

130 135 140

145 150 155

Thr Gly Asp Pro Glu Met Cys Pro Glu Asn Gly Ser Cys Val Pro Asp

160 165 170

Gly Pro Gly Leu Leu Gln Cys Val Cys Ala Asp Gly Phe His Gly Tyr

175 180 185 190

Lys Cys Met Arg Gln Gly Ser Phe Ser Leu Leu Met Phe Phe Gly Ile

195 200 205

Leu Gly Ala Thr Thr Leu Ser Val Ser Ile Leu Leu Trp Ala Thr Gln

210 215 220

Arg Arg Lys Ala Lys Thr Ser

225

<210> 35

<211> 841

<212> DNA

<213> Homo sapiens

<400> 35

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Met Ser Pro Ser Gly Arg

1 5

ctg tgt ctt ctc acc atc gtt ggc ctg att ctc ccc acc aga gga cag 104

acg ttg aaa gat acc acg tcc agt tct tca gca gac tca act atc atg 152

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                25                  30                  35
gac att cag gtc ccg aca cga gcc cca gat gca gtc tac aca gaa ctc   200
Asp Ile Gln Val Pro Thr Arg Ala Pro Asp Ala Val Tyr Thr Glu Leu
        40                  45                  50
cag ccc acc tct cca acc cca acc tgg cct gct gat gaa aca cca caa   248
Gln Pro Thr Ser Pro Thr Pro Thr Trp Pro Ala Asp Glu Thr Pro Gln
    55                  60                  65                  70
ccc cag acc cag acc cag caa ctg gaa gga acg gat ggg cct cta gtg   296
Pro Gln Thr Gln Thr Gln Gln Leu Glu Gly Thr Asp Gly Pro Leu Val
                75                  80                  85
aca gat cca gag aca cac aag agc acc aaa gca gct cat ccc act gat   344
Thr Asp Pro Glu Thr His Lys Ser Thr Lys Ala Ala His Pro Thr Asp
            90                  95                  100
gac acc acg acg ctc tct gag aga cca tcc cca agc aca gac gtc cag   392
Asp Thr Thr Thr Leu Ser Glu Arg Pro Ser Pro Ser Thr Asp Val Gln
        105                 110                 115
aca gac ccc cag acc ctc aag cca tct ggt ttt cat gag gat gac ccc   440
Thr Asp Pro Gln Thr Leu Lys Pro Ser Gly Phe His Glu Asp Asp Pro
    120                 125                 130
ttc ttc tat gat gaa cac acc ctc cgg aaa cgg ggg ctg ttg gtc gca   488
Phe Phe Tyr Asp Glu His Thr Leu Arg Lys Arg Gly Leu Leu Val Ala
135                 140                 145                 150
gct gtg ctg ttc atc aca ggc atc atc atc ctc acc agt ggc aag tgc   536

agg cag ctg tcc cgg tta tgc cgg aat cat tgc agg tgagtcca          580
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170 175

tcagaaacag gagctgacaa ccegctgggc accegaagac caagccccct gccagctcac 640

cgtgcccagc ctcctgcatc ccctcgaaga gcctggccag agagggaaga cacagatgat 700

gaagctggag ccagggctgc cggtccgagt ctcctaccte ccccaaccct gccegccect 760

gaaggctacc tggcgccttg ggggctgtcc ctcaagttat ctcctctgtt aagacaaaaa 820

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<210> 36

<211> 178

<212> PRT

<213> Homo sapiens

<400> 36

Met Ser Pro Ser Gly Arg

1 5

Leu Cys Leu Leu Thr Ile Val Gly Leu Ile Leu Pro Thr Arg Gly Gln

10 15 20

Thr Leu Lys Asp Thr Thr Ser Ser Ser Ser Ala Asp Ser Thr Ile Met

25 30 35

Asp Ile Gln Val Pro Thr Arg Ala Pro Asp Ala Val Tyr Thr Glu Leu

40 45 50

Gln Pro Thr Ser Pro Thr Pro Thr Trp Pro Ala Asp Glu Thr Pro Gln

75 80 85

90 95 100

Asp Thr Thr Thr Leu Ser Glu Arg Pro Ser Pro Ser Thr Asp Val Gln

105 110 115

Thr Asp Pro Gln Thr Leu Lys Pro Ser Gly Phe His Glu Asp Asp Pro

120 125 130

Phe Phe Tyr Asp Glu His Thr Leu Arg Lys Arg Gly Leu Leu Val Ala

135 140 145 150

Ala Val Leu Phe Ile Thr Gly Ile Ile Ile Leu Thr Ser Gly Lys Cys

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Arg Gln Leu Ser Arg Leu Cys Arg Asn His Cys Arg

170 175

<210> 37

<211> 1451

<212> DNA

<213> Homo sapiens

<400> 37

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gcccgctcca tggcggtgga tgcctgactg gaagccccgag tggg atg cgg ctg acg 116

Met Arg Leu Thr

1

5 10 15 20

Leu Tyr Ala Ala Tyr His Val Phe Phe Gly Arg Arg Arg Gln Ala Pro

25 30 35

gcc ggg tcc ccg cgg ggc ctc agg aag ggg gcg gcc ccc gcg cgg gag 260

Ala Gly Ser Pro Arg Gly Leu Arg Lys Gly Ala Ala Pro Ala Arg Glu

40 45 50

aga cgc ggc cga gaa cag tcc act ttg gaa agt gaa gaa tgg aat cct 308

Arg Arg Gly Arg Glu Gln Ser Thr Leu Glu Ser Glu Glu Trp Asn Pro

55 60 65

tgg gaa gga gat gaa aaa aat gag caa caa cac aga ttt aaa act agc 356

Trp Glu Gly Asp Glu Lys Asn Glu Gln Gln His Arg Phe Lys Thr Ser

70 75 80

ctt caa ata tta gat aaa tcc acg aaa gga aaa aca gat ctc agt gta 404

Leu Gln Ile Leu Asp Lys Ser Thr Lys Gly Lys Thr Asp Leu Ser Val

85 90 95 100

caa atc tgg ggc aaa gct gcc att ggc ttg tat ctc tgg gag cat att 452

Gln Ile Trp Gly Lys Ala Ala Ile Gly Leu Tyr Leu Trp Glu His Ile

105 110 115

ttt gaa ggc tta ctt gat ccc agc gat gtg act gct caa tgg aga gaa 500

Phe Glu Gly Leu Leu Asp Pro Ser Asp Val Thr Ala Gln Trp Arg Glu

120 125 130

gga aag tca atc gta gga aga aca cag tac agc ttc atc act ggt cca 548

Gly Lys Ser Ile Val Gly Arg Thr Gln Tyr Ser Phe Ile Thr Gly Pro

135 140 145

150 155 160

ile leu asn gly arg glu lys ala lys ile phe tyr ala thr gln trp

165 170 175 180

tta ctt tat gca caa aat tta gtg caa att caa aaa ctc cag cat ctt 692

Leu Leu Tyr Ala Gln Asn Leu Val Gln Ile Gln Lys Leu Gln His Leu

185 190 195

gct gtt gtt ttg ctc gga aat gaa cat tgt gat aat gag tgg ata aac 740

Ala Val Val Leu Leu Gly Asn Glu His Cys Asp Asn Glu Trp Ile Asn

200 205 210

cca ttc ctc aaa aga aat gga ggc ttc gtg gag ctg ctt ttc ata ata 788

Pro Phe Leu Lys Arg Asn Gly Gly Phe Val Glu Leu Leu Phe Ile Ile

215 220 225

tat gac agc ccc tgg att aat gac gtg gat gtt ttt cag tgg cct tta 836

Tyr Asp Ser Pro Trp Ile Asn Asp Val Asp Val Phe Gln Trp Pro Leu

230 235 240

gga gta gca aca tac agg aat ttt cct gtg gtg gag gca agt tgg tca 884

Gly Val Ala Thr Tyr Arg Asn Phe Pro Val Val Glu Ala Ser Trp Ser

245 250 255 260

atg ctg cat gat gag agg cca tat tta tgt aat ttc tta gga acg att 932

Met Leu His Asp Glu Arg Pro Tyr Leu Cys Asn Phe Leu Gly Thr Ile

265 270 275

tat gaa aat tca tcc aga cag gca cta atg aac att ttg aaa aaa gat 980

Tyr Glu Asn Ser Ser Arg Gln Ala Leu Met Asn Ile Leu Lys Lys Asp

280 285 290

295 300 305

Gln Glu Thr Asn Glu Ser Leu Lys Asn Tyr Gln Asp Ala Leu Leu Gln

310 315 320

agt gat ctc aca ttg tgc ccg gtc gga gta aac aca gaa tgc tat cga 1124

Ser Asp Leu Thr Leu Cys Pro Val Gly Val Asn Thr Glu Cys Tyr Arg

325 330 335 340

atc tat gag gct tgc tcc tat ggc tcc att cct gtg gtg gaa gac gtg 1172

Ile Tyr Glu Ala Cys Ser Tyr Gly Ser Ile Pro Val Val Glu Asp Val

345 350 355

atg aca gct ggc aac tgt ggg aat aca tct gtg cac cac ggt gct cct 1220

Met Thr Ala Gly Asn Cys Gly Asn Thr Ser Val His His Gly Ala Pro

360 365 370

ctg cag tta ctc aag tcc atg ggt gct ccc ttt atc ttt atc aag aac 1268

Leu Gln Leu Leu Lys Ser Met Gly Ala Pro Phe Ile Phe Ile Lys Asn

375 380 385

tgg aag gaa ctc cct gct gtt tta gaa aaa gag aaa act ata att tta 1316

Trp Lys Glu Leu Pro Ala Val Leu Glu Lys Glu Lys Thr Ile Ile Leu

390 395 400

caa gaa aaa att gaa aga aga aaa atg tta ctt cag tgg tat cag cac 1364

Gln Glu Lys Ile Glu Arg Arg Lys Met Leu Leu Gln Trp Tyr Gln His

405 410 415 420

ttc aag aca gag ctt aaa atg aaa ttt act aat att tta gaa agc tca 1412

Phe Lys Thr Glu Leu Lys Met Lys Phe Thr Asn Ile Leu Glu Ser Ser

425 430 435

440

<210> 38

<211> 443

<212> PRT

<213> Homo sapiens

<400> 38

Met Arg Leu Thr

1

Arg Lys Arg Leu Cys Ser Phe Leu Ile Ala Leu Tyr Cys Leu Phe Ser

5 10 15 20

Leu Tyr Ala Ala Tyr His Val Phe Phe Gly Arg Arg Arg Gln Ala Pro

25 30 35

Ala Gly Ser Pro Arg Gly Leu Arg Lys Gly Ala Ala Pro Ala Arg Glu

40 45 50

Arg Arg Gly Arg Glu Gln Ser Thr Leu Glu Ser Glu Glu Trp Asn Pro

55 60 65

Trp Glu Gly Asp Glu Lys Asn Glu Gln Gln His Arg Phe Lys Thr Ser

70 75 80

Leu Gln Ile Leu Asp Lys Ser Thr Lys Gly Lys Thr Asp Leu Ser Val

85 90 95 100

Gln Ile Trp Gly Lys Ala Ala Ile Gly Leu Tyr Leu Trp Glu His Ile

105 110 115

Gly Lys Ser Ile Val Gly Arg Thr Gln Tyr Ser Phe Ile Thr Gly Pro

Ala Val Ile Pro Gly Tyr Phe Ser Val Asp Val Asn Asn Val Val Leu

150 155 160

Ile Leu Asn Gly Arg Glu Lys Ala Lys Ile Phe Tyr Ala Thr Gln Trp

165 170 175 180

Leu Leu Tyr Ala Gln Asn Leu Val Gln Ile Gln Lys Leu Gln His Leu

185 190 195

Ala Val Val Leu Leu Gly Asn Glu His Cys Asp Asn Glu Trp Ile Asn

200 205 210

Pro Phe Leu Lys Arg Asn Gly Gly Phe Val Glu Leu Leu Phe Ile Ile

215 220 225

Tyr Asp Ser Pro Trp Ile Asn Asp Val Asp Val Phe Gln Trp Pro Leu

230 235 240

Gly Val Ala Thr Tyr Arg Asn Phe Pro Val Val Glu Ala Ser Trp Ser

245 250 255 260

Met Leu His Asp Glu Arg Pro Tyr Leu Cys Asn Phe Leu Gly Thr Ile

265 270 275

Tyr Glu Asn Ser Ser Arg Gln Ala Leu Met Asn Ile Leu Lys Lys Asp

280 285 290

Gly Asn Asp Lys Leu Cys Trp Val Ser Ala Arg Glu His Trp Gln Pro

295 300 305

Gln Glu Thr Asn Glu Ser Leu Lys Asn Tyr Gln Asp Ala Leu Leu Gln

310 315 320

Ser Asp Leu Thr Leu Cys Pro Val Gly Val Asn Thr Glu Cys Tyr Arg

[illegible]

345 350 355

360 365 370

Leu Gln Leu Leu Lys Ser Met Gly Ala Pro Phe Ile Phe Ile Lys Asn

375 380 385

Trp Lys Glu Leu Pro Ala Val Leu Glu Lys Glu Lys Thr Ile Ile Leu

390 395 400

Gln Glu Lys Ile Glu Arg Arg Lys Met Leu Leu Gln Trp Tyr Gln His

405 410 415 420

Phe Lys Thr Glu Leu Lys Met Lys Phe Thr Asn Ile Leu Glu Ser Ser

425 430 435

Phe Leu Met Asn Asn Lys Ser

440

<210> 39

<211> 886

<212> DNA

<213> Homo sapiens

<400> 39

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tc atg gag acc ctg ggg gcc ctt ctg gtg ctg gag ttt ctg ctc ctc 107

Met Glu Thr Leu Gly Ala Leu Leu Val Leu Glu Phe Leu Leu Leu

1 5 10 15

20 25 30

Leu Val Gly Leu Ala Ala Val Val Gly Phe Leu Phe Ile Val Tyr Leu

35 40 45

gtc ttg ctg gcc aac cgc ctc tgg tgt tcc aag gcc agg gct gag gac 251

Val Leu Leu Ala Asn Arg Leu Trp Cys Ser Lys Ala Arg Ala Glu Asp

50 55 60

gag gag gag acc acg ttc aga atg gag tcc aac cta tac cag gac cag 299

Glu Glu Glu Thr Thr Phe Arg Met Glu Ser Asn Leu Tyr Gln Asp Gln

65 70 75

agt gaa gac aag aga gag aag aaa gag gcc aag gag aaa gaa gag aag 347

Ser Glu Asp Lys Arg Glu Lys Lys Glu Ala Lys Glu Lys Glu Glu Lys

80 85 90 95

agg aag aag gag aaa aag aca gca aag gaa gga gag agc aac ttg gga 395

Arg Lys Lys Glu Lys Lys Thr Ala Lys Glu Gly Glu Ser Asn Leu Gly

100 105 110

ctg gat ctg gag gaa aaa gag ccc gga gac cat gag aga gca aag agc 443

Leu Asp Leu Glu Glu Lys Glu Pro Gly Asp His Glu Arg Ala Lys Ser

115 120 125

aca gtc atg tgaagatt cctggctgcc tcttccaggc agtccccccag agatgcctct 500

Thr Val Met

130

tctgcccccct aaaagcagtg ccctggactt gaagcccgtg aaatgactcc atctgggatt 560

cagaatacag tgttctcaag tgaagaaggc ttggaaccca ccccacctcc ctcattgggg 620

gctctctggg caaaacatggt tttcatgcac cctcttcct gagcttggtc cctgcctggt 680

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ctgaacagaa cttccccctct cccatgcacc cactgccagc tgagagctgc ttcccaatgg 860

<210> 40

<211> 130

<212> PRT

<213> Homo sapiens

<400> 40

Met Glu Thr Leu Gly Ala Leu Leu Val Leu Glu Phe Leu Leu Leu
1 5 10 15

Ser Pro Val Glu Ala Gln Gln Ala Thr Glu His Arg Leu Lys Pro Trp
20 25 30

Leu Val Gly Leu Ala Ala Val Val Gly Phe Leu Phe Ile Val Tyr Leu
35 40 45

Val Leu Leu Ala Asn Arg Leu Trp Cys Ser Lys Ala Arg Ala Glu Asp
50 55 60

Glu Glu Glu Thr Thr Phe Arg Met Glu Ser Asn Leu Tyr Gln Asp Gln
65 70 75

Ser Glu Asp Lys Arg Glu Lys Lys Glu Ala Lys Glu Lys Glu Glu Lys
80 85 90 95

Arg Lys Lys Glu Lys Lys Thr Ala Lys Glu Gly Glu Ser Asn Leu Gly
100 105 110

Leu Asp Leu Glu Glu Lys Glu Pro Gly Asp His Glu Arg Ala Lys Ser
115 120 125

Ser
130